S. HRG. 101-220

THE SERIOUSNESS AND EXTENT OF GROUND WATER CONTAMINATION

HEARING

BEFORE THE

SUBCOMMITTEE ON
SUPERFUND, OCEAN, AND WATER PROTECTION

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

AUGUST 1, 1989

Printed for the use of the
Committee on Environment and Public Works

U.S. GOVERNMENT PRINTING OFFICE

21-704 WASHINGTON : 1989

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

S321-35

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

QUENTIN N. BURDICK, North Dakota, *Chairman*

DANIEL PATRICK MOYNIHAN, New York
GEORGE J. MITCHELL, Maine
MAX BAUCUS, Montana
FRANK R. LAUTENBERG, New Jersey
JOHN B. BREAUX, Louisiana
HARRY REID, Nevada
BOB GRAHAM, Florida
JOSEPH I. LIEBERMAN, Connecticut

JOHN H. CHAFEE, Rhode Island
ALAN K. SIMPSON, Wyoming
STEVE SYMMS, Idaho
DAVID DURENBERGER, Minnesota
JOHN W. WARNER, Virginia
JAMES M. JEFFORDS, Vermont
GORDON J. HUMPHREY, New Hampshire

DAVID M. STRAUSS, *Staff Director*
ROBERT F. HURLEY, *Minority Staff Director*

SUBCOMMITTEE ON SUPERFUND, OCEAN, AND WATER PROTECTION

FRANK LAUTENBERG, *Chairman*

GEORGE J. MITCHELL, Maine
MAX BAUCUS, Montana
BOB GRAHAM, Florida

DAVE DURENBERGER, Minnesota
ALAN K. SIMPSON, Wyoming
STEVE SYMMS, Idaho

CONTENTS

OPENING STATEMENTS

	Page
Durenberger, Hon. Dave, U.S. Senator from the State of Minnesota	18
Graham, Hon. Bob, U.S. Senator from the State of Florida	2
Lautenberg, Hon. Frank R., U.S. Senator from the State of New Jersey	1

WITNESSES

Bruemmer, Linda, Section Chief, Program Development, Minnesota Pollution Control Agency	20
Written statement	139
Protecting Minnesota's Waters	155
Minnesota Groundwater Protection Strategy	158
Fisher, John N., Acting Director, U.S. Geological Survey	5
Written statement	58
Hanmer, Rebecca, Acting Assistant Administrator for Water, Environmental Protection Agency	2
Written statement	36
Jenkins, Jeannie, staff biologist, New Jersey Public Interest Group	22
Written statement	161
Long, Robert, Deputy Assistant Secretary for Science and Education, Department of Agriculture	6
Written statement	67
Water Quality Program Plan	77
Olson, Erik D., counsel, Environmental Quality Division, National Wildlife Federation	16
Written statement	108
Strelow, Roger, vice president, environmental programs, General Electric	24
Written statement	169

THE SERIOUSNESS AND EXTENT OF GROUNDWATER CONTAMINATION

TUESDAY, AUGUST 1, 1989

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON SUPERFUND, OCEAN,
AND WATER PROTECTION,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:45 a.m., in room 406, Dirksen Senate Office Building, Hon. Frank R. Lautenberg (chairman of the subcommittee) presiding.

Present: Senators Lautenberg, Symms, Baucus, Graham, and Durenberger.

OPENING STATEMENT OF HON. FRANK R. LAUTENBERG, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Senator LAUTENBERG. The subcommittee will come to order.

This morning the Subcommittee on Superfund, Ocean, and Water Protection will begin its consideration of the need to protect the Nation's groundwater resources. Today we are going to hear testimony about the seriousness and the extent of groundwater contamination.

In the fall I plan to convene hearings on legislation to address groundwater contamination. While the U.S. Geological Survey reports that the quality of the Nation's groundwater generally is good, at least one-third of the Nation's groundwater is contaminated. Groundwater contamination has occurred in every State and is being detected with increasing frequency. This contamination has adverse health, social, environmental, and economic consequences which are likely to increase if we fail to act.

Groundwater is of special significance in my State. Over 50 percent of the people in New Jersey get their drinking water from groundwater supplies. EPA has designated six groundwater sources in New Jersey, covering 90 percent of the State and serving over four million people, as sole source aquifers.

Fortunately, our State has a sufficient supply of good quality groundwater for most uses throughout the State. There are, however, some serious local problems. Since 1970, nearly 1,200 wells have been closed because of contamination from organic compounds and other materials; 200 other wells have been closed because of other contaminants.

A 1985 State survey found that 18 percent of New Jersey's public water supplies had detectable concentrations of one or more organic contaminants.

These figures should provide us with sufficient warning to take heed for strong action to prevent groundwater contamination before it occurs.

This morning we will hear from Federal agencies primarily concerned with groundwater protection, and from outside witnesses representing a spectrum of opinion.

Before I welcome our witnesses I would ask any of my colleagues whether they have opening statements. Senator Symms?

Senator SYMMS. No opening statement, Mr. Chairman.

Senator LAUTENBERG. Senator Graham.

OPENING STATEMENT OF HON. BOB GRAHAM, U.S. SENATOR FROM THE STATE OF FLORIDA

Senator GRAHAM. Mr. Chairman, I am very pleased that you are holding this hearing. Groundwater is an extremely important issue for our State. Florida is blessed with an abundant quantity of water, but it is water which exists in very vulnerable locations. Over 90 percent of our water consumption is from groundwater. We are, in many areas of the State, subject to surface-level, activities which can endanger the quality of that groundwater. The Federal Government has a key role with the State and local governments and private entities in protecting that vital resource.

I am pleased that you are focusing this national attention.

Senator LAUTENBERG. Thank you very much.

Senator Baucus.

Senator BAUCUS. No statement, thank you.

Senator LAUTENBERG. Thank you.

I want to welcome our witnesses and say that we look forward to their testimony. We would ask you to try to summarize your testimony and keep it within five minutes so that there will be enough time to hear everyone and for questions.

First we would like to ask Ms. Hanmer if she would identify herself and give her testimony.

STATEMENT OF REBECCA HANMER, ACTING ASSISTANT ADMINISTRATOR FOR WATER, ENVIRONMENTAL PROTECTION AGENCY, ACCOMPANIED BY MARIAN MLAY, DIRECTOR, OFFICE OF GROUNDWATER PROTECTION

Ms. HANMER. Thank you, Mr. Chairman. I appreciate the opportunity to discuss the issues concerning groundwater contamination. I am Rebecca Hanmer, Acting Assistant Administrator for Water at the Environmental Protection Agency. I have with me today Marian Mlay, who is the Director of our Office of Groundwater Protection in the Environmental Protection Agency. We are both pleased to be here to talk about this issue.

I will briefly summarize my statement as you have requested and submit the longer statement for the record.

I would also like to submit for your review a 1987 report that EPA did which compiles our information on groundwater contamination, on sources, and on what the Federal Government and the

States were doing about it as of 1987, which is a good summary of the information that we have available to us.

As you have indicated, the importance of protecting groundwater quality is being increasingly recognized, not only in protecting sources of drinking water but also with regard to groundwater's other beneficial uses, such as agricultural production, mining, and manufacturing. About one-fourth of all the fresh water used in this country comes from underground sources. Groundwater currently provides drinking water for 50 percent of our population, or about 117 million Americans; 35 percent of the drinking water supply used in urban areas; and 95 percent of the supply in rural areas.

Groundwater also has important ecological functions that we need to take into account. Our ground and surface waters are often interconnected, and in many settings groundwater maintains the base flow of streams, wetlands, and other aquatic ecosystems. In coastal areas, careful management of fresh groundwater supplies helps prevent saltwater intrusion into potable aquifers. In addition, the quality of groundwater is important in maintaining ecosystems, including those supporting endangered species.

EPA addresses groundwater contamination at present under the authority of a variety of Federal statutes. In the Safe Drinking Water Act, we protect the Nation's drinking water by setting drinking water standards and by enforcing them. We also have, through the 1986 amendments, an important new program for the States to establish wellhead protection programs. We also control underground injection of hazardous wastes and other fluids under the Safe Drinking Water Act. We are developing nonpoint source strategies at the State level under Section 319 of the Clean Water Act, and increasingly we think that these nonpoint source strategies will merge with groundwater protection strategies.

Finally, we have other authorities addressing particular sources of contamination, such as the Federal Insecticide, Fungicide, and Rodenticide Act, Superfund, and the Resource Conservation and Recovery Act.

I think there are three important observations I would like to make in the brief time available rather than cite all the statistics in the testimony itself.

We don't think there is a national crisis in groundwater contamination at this time. There are, as you indicate, very serious problems in a number of localities that need to be addressed, and I think that we learn more every day about the potential of a variety of land management activities to affect groundwater quality.

Groundwater contamination is a problem that greatly challenges the ingenuity and the institutional capacities of government at all levels. Again, very much like the nonpoint source problem, it is an issue that has to be dealt with at the local level, the State level, and the Federal level. In addition to our specific problems, there is a shortage in many areas of the United States of skilled scientists and technicians to really address the types of problems with which we are dealing.

Finally, our current data on the sources of groundwater contamination, which are often cited, and our current health effects data, are actually quite limited. Groundwater monitoring is expensive and technically difficult. The data that we will cite to you have his-

torically been gathered for only selected contaminants or sources, and usually only for specific purposes.

Our statement summarizes the information that we currently have available on groundwater contamination sources. Many of these groundwater problems, if not most, are from natural sources of contamination. Man-made sources of contamination are associated with virtually all types of land use, and an estimated two-thirds of these are from non-waste management activities; that is, commercial activities like agricultural production and storage tanks.

In their recent reports to us under section 305(b), States report major concern with sources such as underground storage tanks, abandoned hazardous waste sites, agricultural use of pesticides and fertilizers, septic tanks, surface impoundments, and municipal landfills. However, there is a very high degree of diversity among geographic areas in the significance of different sources, especially when you take into account the significance of the sources of contamination to the actual use being made of groundwater.

As State and local governments develop wellhead protection programs, we are struck by the variety of contamination problems that come to light as actually affecting specific wellfields when you take into account location and actual human exposure—all the way from the dog pound to the gasoline storage tanks at the municipal building. We are literally finding millions of different types of problems.

So what is most striking about the groundwater situation is the enormous diversity of sources and the geographic consequences of different sources; the sheer numbers—that is, the millions of sources; and the relative lack of information that we have about the real world impact of most of these sources; and the vastness of the resource. Groundwater resources are 50 times greater in volume than all of the Nation's surface waters at any given point in time.

This leads us to the conclusion that to address groundwater contamination with any sort of comprehensive Federal groundwater protection, the system would be prohibitively expensive and yield uncertain public benefits if you compare them with the clean air and surface water legislation; that any subset of sources that we pick at the Federal level is bound to miss a variety of causes of groundwater contamination in particular localities; and especially, to miss the crucial dimension of land use.

That is why we have been pushing very hard for comprehensive State programs that address the variety of sources within a given State. We have been providing grant funding as well as technical assistance to the States. Further, we are implementing the 1986 Safe Drinking Water Act provisions for developing wellhead protection programs, which are going to fit the solutions to the problems and which in our view address the highest priority uses of the groundwater resource, that is, for drinking water.

This concludes my statement. I will be happy to answer your questions and provide further information for the record as you may desire.

Senator LAUTENBERG. Thank you very much, Ms. Hanmer.

Mr. Fischer, we invite you to speak next, with the same admonition that you try to keep your testimony within the five minute period.

STATEMENT OF JOHN N. FISCHER, ACTING DIRECTOR, U.S. GEOLOGICAL SURVEY, ACCOMPANIED BY PHILIP COHEN, CHIEF HYDROLOGIST

Mr. FISCHER. Thank you, Mr. Chairman. I am Jack Fischer and I am the Acting Director of the U.S. Geological Survey.

Mr. Chairman, members of the subcommittee, I am pleased to have the opportunity to represent the U.S. Geological Survey and appear before you today to discuss national groundwater issues. I am accompanied by Philip Cohen, Chief Hydrologist of the U.S. Geological Survey.

Mr. Chairman, the mission of the USGS is to develop scientific data and knowledge to support the activities of Federal, State, and local agencies. The USGS spends about $85 million a year on activities related to groundwater quantity and quality, including a major program of technical assistance to Federal, State, and local agencies. We neither manage nor regulate water resources; that important fact places us in a neutral position, and for over 100 years that has enhanced the usefulness of our analyses.

Many of our activities are carried out in cooperation with over 950 State and local agencies, which provide about $60 million to the USGS each year to conduct activities of mutual interest and concern. Many other water activities of the USGS are carried out in cooperation with Federal agencies such as EPA and the Department of Agriculture, with whom we have established formal agreements to coordinate activities such as data collection, research and surveys, and technical assistance.

Working with Federal and State organizations, we manage a network of over 31,000 surface water stations and over 11,000 groundwater sampling sites which provide the basic information necessary for managing our Nation's water resources.

Mr. Chairman, you posed five questions to us in your letter of invitation. First you asked, what is the seriousness and extent of the groundwater pollution problem?

Documentation of groundwater contamination is provided in a USGS publication entitled "National Water Summary, 1986" which describes water quality on a State-by-State basis. The report includes the information that most groundwater meets State and Federal drinking water standards and is suitable for most uses. Rough estimates have been made by others that volumetrically only a few percent of our groundwater is contaminated. These estimates are difficult to confirm, however, and are not particularly useful in themselves because the real issue relates to where water is being used and where contamination is found. These locations tend to coincide.

Also, it is important that most assessments of groundwater quality are based largely on analyses of inorganic chemicals inasmuch as data on trace elements and organic compounds are sparse. Yet, in terms of understanding their fate in the environment, it is the organic compounds that pose the greatest risk and challenge to us

today. Moreover, although we know that high concentrations of contaminants are found in groundwater at numerous small, point-source sites throughout the Nation, there also are some large multi-county and multi-State areas in which groundwater is susceptible to contamination, generally associated with human activities such as production agriculture, use of lawn and garden chemicals, or domestic waste disposal.

We believe this nonpoint source issue is important and we are devoting considerable effort to it today.

Your second question was, what are the most significant sources of groundwater pollution? The major sources of groundwater pollution are, (1) intentional waste disposal activities, which includes sewage disposal lagoons, septic tanks, sanitary landfills, hazardous material disposal sites, and deep well injection; (2) accidental spills or losses of hazardous materials, which include leaks from gasoline, petroleum, or solvent storage tanks, breaks in pipelines, and accidents associated with the transportation of hazardous materials; (3) the application of chemicals to the land surface, which includes the application of fertilizers and pesticides to agricultural fields, forests, rangelands, lawns, gardens, and golf courses, as well as the application of deicing compounds to roads; (4) the migration of polluted surface water into groundwater systems; and (5) the migration of naturally-occurring hazardous substances due to changes in hydrologic conditions, which includes a variety of processes whereby naturally-occurring saline waters or waters containing harmful amounts of other naturally-occurring substances, such as arsenic, boron, or selenium, migrate toward wells or drains as water is pumped from an aquifer.

You asked about differences in the seriousness and extent of the groundwater pollution problem from one area of the country to another. Contamination problems nationwide do differ, not only in severity but also in kind. They are a function of the types of human activities, climate, soils, and hydrogeologic characteristics of the area. In general, problems tend to be the most severe in areas of more human activity; of course, these are also the areas of largest water use.

Your final question was, what are the costs of groundwater protection relative to the costs of cleaning up groundwater contamination?

Mr. Chairman, in most cases prevention and/or source reduction is much more cost effective than cleanup. Clean-up costs are highly variable, depending on the contaminant and site hydrology. Specific cost information is a subject that could be best provided by the Environmental Protection Agency.

Mr. Chairman, that concludes my verbal testimony. I will be pleased to answer any questions you or your colleagues may have.

Senator LAUTENBERG. Thank you very much, Mr. Fischer.

Now we would ask Mr. Long to speak, under the same rules.

STATEMENT OF ROBERT LONG, DEPUTY ASSISTANT SECRETARY FOR SCIENCE AND EDUCATION, DEPARTMENT OF AGRICULTURE

Mr. LONG. Thank you, Mr. Chairman, Senator Graham. I also welcome this opportunity to appear before you to discuss the seri-

ousness and the extent of the groundwater pollution problem. I have submitted a copy of my statement to the subcommittee and would ask that it appear in full in the record.

Senator LAUTENBERG. Without objection.

Mr. LONG. In your letter of invitation to this hearing, Mr. Chairman, you note that there is growing evidence that the quality of groundwater is threatened by a wide range of pollution sources. Among those sources are agricultural chemicals, fertilizers, and animal wastes.

We agree that agricultural practices are a part of the groundwater contamination problem. You pose appropriate questions when you ask about the extent and seriousness of the problem.

While we generally know that there are problems, it is difficult from information that we presently have in hand to pinpoint them. As earlier testimony has indicated, we can talk in general terms about potential problems—in the cornbelt, for example, or in other farming-intensive regions—and we can identify those issues associated with large concentrations of cattle, such as feedlots, large dairy herd operations, and so forth.

The Economic Research Service recently released a study that provided a broad perspective on potential costs of groundwater contamination and indicated regions of the country most vulnerable to pesticide and nitrate contamination.

We are presently working with the U.S. Geological Survey, the Environmental Protection Agency, and other agencies of the Federal system to help focus our research and technical assistance programs. USDA is currently investing approximately $140 million in these programs, and we anticipate a significant increase in fiscal year 1990. The Department, as a part of the President's water quality initiative, has proposed increasing spending for water quality work to the level of approximately $180 million for this coming fiscal year.

I have included the specifics of the Department's part of the initiative as part of my statement. I would turn now to your question relating to the evidence of the health effects of groundwater contamination.

In evaluating the long-term delayed effects of contact, breathing, or ingesting agricultural chemicals, we prefer to use epidemiological studies. Even though they often have a low degree of reliability, they are necessary and important tools for investigating and screening potential causes of health problems for defining priorities for more detailed investigations.

The analysis of the relative importance of long-term health risks is further hampered by some limitations on the available test methods and procedures. For example, the inappropriateness of experimenting on human subjects has led to a dependence on laboratory animals with little analysis of how the results of those tests actually related to human health or longevity in the context of multiple risks.

Nutrients, including nitrates and nitrites from both natural and synthetic sources, are present in the foods we eat and in the environment around us. In proper amounts they are essential to life; when too little or too much is present, they can cause a variety of health problems, including serious illness and death. While over-

doses of any of the nutrients commonly applied in agriculture, such as phosphorus, calcium, and potassium, can cause health problems, nitrates and nitrites are presently attracting the most attention because of the numerous examples of nitrates in groundwater.

We are aware of many other studies on nitrates and nitrites, including those done in Great Britain, Germany, and Denmark. We would be pleased to share the information with you and the members of the subcommittee if you so wish.

Suffice to say, we recognize that agricultural practices do impact health, and we are diligently striving through research, education, and technical assistance programs to reduce the adverse impacts of agriculture on health and the environment. USDA has a number of research and extension programs looking at ways to reduce chemical applications while preserving profitability.

Mr. Chairman, we work closely with other Federal agencies, such as USGS and the Environmental Protection Agency, in carrying out our programs. I am going to defer to these agencies in responding to your questions regarding regulation and the costs of cleaning up groundwater contamination.

In any case, I indicated that I would include specific details about the Department's role in the water quality initiative. A significant portion of the water quality initiative is aimed at providing answers to the type of questions you have posed. The 1990 USDA program proposes to focus attention on research and data base development programs to provide the framework for enhanced technical assistance and education efforts to assist farm producers. Programs proposed in the budget will be carried out directly by USDA agencies and through State partners in the research, technical assistance, and education communities.

I have representatives with me this morning of five Department agencies who can speak in greater detail about the development program. I have included a detailed description of the program in my prepared statement. Here is a brief summary, however.

A $13.9 million increase is sought for a coordinated research program, to be conducted at Federal laboratories by the Agricultural Research Service through and with the Cooperative State Research Service. The expanded program will build on the base of ongoing research in nitrogen and pesticide degradation in soils, sediment research, development of models, and work on biological controls and integrated pest management. Research will be conducted through a systems approach which will assure consideration of economic, environmental, and social consequences of the improved production practices.

Specific major research objectives are to determine the extent and seriousness of potential agricultural contributions to nonpoint source contamination; develop improved farm and ranch production systems to maintain and improve water quality without sacrificing profitability; improve the understanding of fate and transport of agricultural chemicals in soils and water; and finally, to develop less costly groundwater sampling techniques. As has been mentioned earlier, it is a very expensive process.

Much of the 1990 increase will fund research on management systems for farmers in the midwest cornbelt. This project recognizes the concentration of corn and soybean production and the

wide use of nitrogen and pesticides in connection with conservation tillage, and the potential susceptibility of soils in the region to contamination by chemicals.

Information on pesticide use will be required to support efforts within USDA and other agencies to assess the magnitude of agriculture-related water quality problems and to develop effective strategies for agricultural chemical management.

Mr. Chairman, I am submitting for the record a copy of USDA's Water Quality Program Plan, which has the details of the implementation process contained in it. You might say that it is right off the press inasmuch as it was finished yesterday, and you are one of the first who will receive this copy. My associates here at the table, other agencies in the Federal Government, other committees in both chambers of the Congress will receive this shortly in order that you will all be informed of what we are doing and what we are trying to accomplish in our groundwater program.

Senator LAUTENBERG. We will include it in the record. (See p. 77.)

Mr. LONG. I do appreciate your invitation to be with you, and I will be pleased to respond to any questions that you or the other members may have. Thank you. That concludes my testimony.

Senator LAUTENBERG. Thank you, Mr. Long.

We will have a 10-minute questioning period for each of the Senators. If necessary, we will have a second round.

I was interested, Ms. Hanmer, in a statement that you made in the written text, on page 3, in which you said that "there is no national crisis of groundwater contamination at this time, although there are serious problems in a number of localities."

On page 4 of your comments you say, "Third, our current data on the sources of groundwater contamination and its health effects are limited because groundwater monitoring is expensive and technically difficult. These data have historically been gathered for only selected contaminants or sources and are usually for a specific purpose," and it goes on.

How do you draw a conclusion that there is not a serious problem—you do say there is a problem, but you say there is not a crisis; it's somewhere between a crisis and a problem—then you qualify it by saying that our resources are limited and that water monitoring is expensive and that we have been historically only gathering data on selected contaminants? That doesn't sound like a very authoritative conclusion that you come to.

Ms. HANMER. I don't think there is any way we can be authoritative, given the poor quality of the available information.

When we are looking at what constitutes a crisis, we would look not only at the question of whether there is contamination—and there assuredly is, both from man-made sources and from natural sources; a lot of groundwater we would consider contaminated. The question is, who is exposed to it? In that regard, we pay the most attention to our drinking water information. On page 9 I gave you some specific information from our surveys of drinking water systems in which we had found contamination in a number of systems. Overall, only 2.5 percent of public water systems exceeded the proposed standards for volatile organic chemicals, though there were much larger numbers in particular areas.

So I guess the distinction I would make is between the contamination and who is exposed to it right now, and what measures we have as a society to take that exposure into account and to protect people.

Senator LAUTENBERG. I wonder if you would know anything about the amount of bottled drinking water purchased by citizens across this country? I have heard that it is as much as 30 to 35 percent. Have you heard that?

Ms. HANMER. I have heard the same statistic, and that drinking water purchases are growing. But I can give you some information for the record if you would like it.

Senator LAUTENBERG. Yes, I would like to see that. I think the American people are saying that whatever conclusions we come up with, they don't believe that it's safe to go to the tap and take a drink of water. That's a disappointment in a society as advanced as ours, that one can't go to the tap and draw a glass of water without feeling like you're damaging your health.

[The information referred to follows:]

ADDITIONAL INFORMATION ON BOTTLED WATER

The two most recent studies of bottled water usage that we have seen conclude that about 15 percent of American households use bottled water and the most prominent reason is because of taste. EPA has not conducted national surveys of households, so we do not have independent information which would cause us to doubt the basic results of these studies.

The most recent study was done in October, 1988 by Tandem Probe, Incorporated for the International Bottled Water Association (IBWA). It was a national statistical random sample of female heads of households. The survey reported that nationally household usage increased from 6 percent in 1986 to 15.1 percent in 1988. However, if the U.S. is divided into nine regions, the survey reported that New England had the highest percentage of use at 27.5 percent, followed by the Pacific region at 25.2 percent and the South Atlantic Region at 19.5 percent. The survey did not address the issue of the income levels of the households using the bottled water.

However, the survey reports that 60 percent of the consumers of bottled water responding mentioned taste as their primary reason for buying bottled water. The other reasons cited were: safety and related reasons, and other uses such as for steam irons and for traveling.

The other survey was done in December 1985 by Audits and Surveys, Inc. for the American Water Works Association Research Foundation. While this study was not directly comparable to the IBWA survey, it yielded similar results: (1) that about 15 percent of households in the U.S. use bottled water; and (2) that the primary reason that respondents gave is that it tastes better. It should also be noted that the survey reports that many consumers use bottled water because they believe it is safer.

It is EPA's strong belief that bottled water is not the long term answer to consumer's desire for water that tastes better or that is safe. As EPA implements the Safe Drinking Water Act Amendments of 1986, the public suppliers of drinking water will move forward to assure the public that their public water supplies are safe.

EPA does not address, through federally enforceable standards, the issue of taste of drinking water supplied by public suppliers. Taste is not related to whether the water is safe to drink. However, EPA recognizes that the public will buy water that has a better taste, and therefore the Agency believes that public suppliers need to be concerned about taste.

Senator LAUTENBERG. Also, I would have to conclude that the one-third that does make the purchase is among the more affluent and the more informed. So we certainly ought to boost our efforts to gain the knowledge that we need to assure people and to make certain that we protect our drinking water and our groundwater supplies as effectively as we can.

Mr. Fischer, you were talking about the fact that you are turning to other people for the purpose of supplying information, do you think there are adequate laws in place now to prevent groundwater contamination from all of the sources of pollution?

Mr. FISCHER. Mr. Chairman, that is not an area in which I am an expert.

Senator LAUTENBERG. Right. Let the experts speak up.

Ms. HANMER. I do not think there are adequate laws in place to protect people from all the sources of contamination that you would be concerned about.

I would draw a distinction, however, between whether or not we need to enact Federal laws or whether or not we really have to look at a lot more local and State control of different types of activities that contaminate groundwater. Our feeling is that because of the variety of uses of groundwater and the variety of uses of the land, we will know a lot more when the localities really do delineate their wellhead protection areas and tell us what is causing the problem, at least to the drinking water supplies that are actually being used. Our results so far are sketchy but, as I said, they are very surprising. There is just a huge variety of activities, and local land use patterns, local development patterns, where gasoline stations go in—just the large variety of issues that you get into—it's rather awesome to think of getting into those other than through strong local programs. I think that we are just beginning to build those right now in a lot of areas.

Senator LAUTENBERG. But we do have impacts on neighboring States. If one State, one region, one locality has a problem, it all eventually evolves into the tributaries that feed the streams that feed the ocean, so you can't disassociate these things. The groundwater supplies are developed from all kinds of sources. You point out in your testimony that it acts as a barrier to salinity moving in from the seashores.

So I am surprised, frankly, to hear you say that we ought to refer this back to the States and let them deal with it. I assume that that's not a blanket statement; I assume that you also include, in your thinking, that the Federal Government has a role to play in helping to develop standards, helping to develop knowledge. Many States just don't have the resources or the skills to develop that information to be able to evaluate it. The Federal Government has a significant role to play.

Mr. LONG. Mr. Chairman, I might comment from the Department's standpoint. We are not involved in regulatory actions. We have most of the authorities that we need. As you may have heard from my testimony this morning, our water quality program is going on under present authority.

So it would appear to us—at least from our point of view, in terms of agricultural waste problems and others—that no new legislation is necessary. We do have the authorities. We think there are sufficient authorities available to the Federal Government and to the States, generally speaking.

I'm not sure we entirely agree to that effect, Rebecca, but you have most of the authority you need, as far as I know, to carry out your programs. Of course, we're on a voluntary basis for the most

part; we ask cooperation and work through education and development programs rather than through regulatory procedures.

Senator LAUTENBERG. Then what's wrong, Mr. Long? Where are we going awry? We're seeing contamination of groundwater continuing to take place.

Do you believe that there is increasing pressure on groundwater supplies by contaminants?

Mr. LONG. Yes. I think there is no question about that although, as we have all testified, our information data bases are very weak in this area. We do not have all that we need to know——

Senator LAUTENBERG. So we ought to strengthen that.

Mr. LONG. Right. And that's part of our program, which you will see when you have a chance to review it.

The problem is particularly of pesticides—not so much nitrates; we've known about the nitrate problem for quite a long time—but pesticides are kind of a new kid on the block. It is only in relatively recent years that we have felt that man-made pesticides could, in fact, reach groundwater supplies. So I think we are cranking up, both at the Federal and State levels where it is appropriate, to try to address the problem because it is a serious issue for the country.

Senator LAUTENBERG. Do we need more laws or enforcement? You say you think we have the authority, but obviously something is falling between the cracks. We have now learned—at least to the surprise of this Senator—that the number of sources of pollution are fairly extensive. The simple old gasoline station now looks like a deadly terrorist attack on the environment in many cases with underground storage tanks. We note that rural water supplies are much more dependent on groundwater typically than are the urban centers. New Jersey is unique in its physical characteristics.

Mr. LONG. I think, Mr. Chairman, that of all the people who are affected in the rural areas, the most affected is the farmer because it is his water supply.

Senator LAUTENBERG. Sure.

Mr. LONG. We believe honestly that if we bring the kind of information to them that they need to know—what they can do in their practices to reduce the contamination; this is the prevention side—that they will follow those practices. But we are still unable to give them in sufficient detail the kind of information that they need to have in order to avoid the contamination issue, of which they are a part. I think that education will be helpful.

Senator LAUTENBERG. Are you suggesting to the farmers—who work hard for their livelihood; harder than lots of people in other positions around the country, other professions—that they have their economic interests in competition with their health interests, and that they ought to be able to make the decision, "Well, I won't use pesticides and hope that the crop will grow, because I am aware, since I have a hydrologist on staff, that our water supply is being contaminated." Of course, I am being facetious when I say "hydrologist on staff;" the hydrologist is the youngster in the farm family who drinks the water and sees how he feels.

So it is fairly obvious to me that you can't rely on the good judgment of someone who is scratching to eke out a living, who loves the soil, loves his vocation, and say, "Okay, use good practices to protect the water supply."

Mr. LONG. We think that they are not incompatible, Mr. Chairman, that you can reduce the level of pesticide use and nitrogen use and still be profitable. That is the kind of balance we are going to attempt to strike in helping them to think through this problem.

Senator LAUTENBERG. I think the Government has a real role here to help in developing the information and providing that information to help in research for other ways to grow things without the use of these materials. I'm stepping into an area that I don't know quite as much about as my friend from Idaho.

Senator SYMMS. Mr. Chairman, thank you, and I want to welcome all of the witnesses here this morning.

I see some familiar faces. Mr. Long, your face is very familiar. I think back to when I was first on the House Committee on Agriculture; you were testifying as Assistant Secretary then. I welcome you back.

In line with the Chairman's question, Mr. Long, from your experience with American farmers, which way do they best respond? If you help them get new technology and better management practices, or if you just come in and slap them with some big Government punitive anti-degradation regulations? Which way do they respond best and most favorably and we get the rest results? I'll bet it's tough, punitive regulations.

Mr. LONG. You have answered the question, Senator Symms. But in any case, you know that I would come down on the side of giving them the information that they need to know and to have, and that they would perform effectively in terms of this problem and other problems like it.

Senator SYMMS. It just happens that three weeks ago when I was home I drove from Salmon, Idaho down to Idaho Falls. I met this fellow who was not a farmer, he had a service station and a grocery store along the Lemhi River that served an agricultural community for about 40 miles in each direction from the nearest service station. He had two 1,000-gallon underground storage tanks, one 500-gallon underground storage tank. About 100 feet from where those tanks were was his domestic well for his family. He has been notified that he has to have this massive insurance program. He sells about 10,000 to 15,000 gallons of fuel a year, so his answer to that is that he's going to close the service station side of his business, thanks to the RCRA law that this Congress passed in an attempt to try to help save underground water supplies.

This is a real good example of a person who, if he has fuel leaking out of a tank, he's the first person to know it. He can taste it in the well water. He doesn't have to have someone from EPA come and tell him that he has a tank leaking; he knows.

But the question I want to ask is this, and Ms. Hanmer, you might want to take a shot at this, on the average which is healthier? A sample of treated, chlorinated city water or a sample of well water from a typical rural farm? Which is the healthiest water?

Ms. HANMER. I really can't answer that question. Obviously, you are running some risk in terms of some kinds of chemicals in your water under either set of circumstances. It is hard to generalize——

Senator SYMMS. I'm not asking for the risks. I don't want a risk analysis. Just on the average, which is the best?

Ms. HANMER. Well, I've spent a lifetime drinking city water, and at least I know that in my city water there are some standards and that it is being monitored. What I don't know about the well water is that we are not generally monitoring the condition of that well water, which is——

Senator SYMMS. I might just say for the Chairman's benefit, that, Dr. Gabe Merkin, to whom I listen on the radio, responded to people's calls about using bottled water by saying that if you live in the Washington, D.C. area you are wasting your money buying bottled water; that the water we drink here is very good, very healthy, not overly treated with chemicals, and that there is absolutely no risk in drinking it, for whatever that's worth. I've stopped buying bottled water.

But looking at the historical aspect of it, wouldn't you say that the city water of Philadelphia or any other major city in the United States is much better today than it was 100 years ago?

Ms. HANMER. I'm sure it is.

Senator SYMMS. Much less risk of typhus and other ailments that can cause problems?

Ms. HANMER. Yes.

Senator SYMMS. So if we can keep this in perspective, it seems to me that we have an opportunity, through technology, to keep our water supplies relatively clean. When you look at some of the countries that have not used modern technology you can't drink the water there without boiling it. You run the risk of getting dysentery or some other ailments.

We have the potential to preserve our water supplies, I think we are on the right track. It seems to me that research is the right answer to quantify what we have.

Mr. Fischer, did you want to comment on that?

Mr. FISCHER. Mr. Symms, the issue that we have come back to several times this morning is information and the fact that we don't have very good information, particularly on the organic contaminants, the man-made organics that were beginning to be manufactured in the late 1940s and 1950s, which we began to discover in our water systems and water supplies in the 1970s and 1980s.

We have been working with the States for over 100 years in a Federal-State cooperative program which is now on the order of $120 million—it's a shared program, $60 million a side—in which we do water quality and water quantity work with them and jointly develop projects and jointly do the work. It is interesting that over the past decade that program has shifted from a water quantity program to a water quality program. I would say that the shift has been dramatic. I think that supports the position here that the information that we're developing is fundamental, and that there is a lack of water quality information. The States recognize that. We are moving toward developing a better organic data base.

In addition to that is the issue of trying to understand how the organics move through the environment. The USGS, in cooperation with EPA and Agriculture, is now working in the mid-continent to develop techniques for sampling for organic contaminants and understanding how they move through the environment so that we can better understand how to regulate and how to advise the farm-

ers and other members of our communities about their water supplies.

Senator SYMMS. I thank you very much.

Mr. Chairman, I might just say that I do think the work that USGS does is important. They do a lot of work in my State with respect to the Idaho Aquifer. It is very important. Unfortunately, they have the great scientific body of evidence of what is really happening with the Idaho Aquifer. No matter how much scientific evidence you have, one headline in a newspaper can carry enormous emotional fear to people, and it oftentimes takes months to get the truth back out. But I hope that eventually we will see that we are capable, if we are not afraid of technology, to take care of this and have a compatible relationship among agriculture, manufacturing, power production, all of these things and the preservation of clean water, because it certainly is within our technological capability. In my view, it's just a matter of not being afraid of the future.

Thank you very much, Mr. Chairman, and I want to thank all the witnesses for being with us this morning.

Mr. Chairman, I know that I'm out of time, but I would just ask one question.

Do any of you have any recommendations you would care to make to Senator Lautenberg and me about any corrective action we should take with respect to RCRA so that we don't close one-third of the small service stations in rural America? Not only service stations, but school bus companies, highway road districts—they're having a terrible time complying. In Preston, Idaho they had to spend $13,000 to dig out a fuel tank that they hadn't used for 20 years at the school bus district. Needless to say, the people were fairly upset with the Environmental Protection Agency over that. That was just to get the tank out of the ground. They hadn't even used it for 15 years, but in order to comply with RCRA they had to do that, so they're not happy about it.

What do you recommend that we do about it?

This is not in your area, I know, Ms. Hanmer, but it does relate to groundwater contamination.

Ms. HANMER. I really can't discuss the details of RCRA with you. I'm just not competent to do it.

I would say, though, that if you look at the Clean Water Act and the way we deal with such matters, it's a matter of considering location and risk at the same time that you are considering what the technology requirements are for very small sources.

Senator LAUTENBERG. Ms. Hanmer, forgive me, and I know my colleague will also forgive me, but I really don't think it's appropriate for this subcommittee, without jurisdiction over RCRA and without the chairman of the subcommittee who has a view on that being present—so if you would, Senator, let's save it for another time.

Senator SYMMS. I'll save it for a good floor amendment.

Senator LAUTENBERG. Anyway you choose to do it. That's the wonder of the Senate; we can do all kinds of interesting things at different times.

Before we leave the subject for this panel, I would just like to note that it is not this Senator's intention to develop a new struc-

ture of rules, regulations, and laws to impede people's movements. But I have an overriding consideration, and that is that I have an obligation to protect the health and well-being of every citizen in this country as much as I possibly can. When I look at the sources for groundwater contamination, including the State of Idaho—septic tanks, underground storage tanks, agricultural activity, landfills, surface impoundments, salt water intrusion—there is no place that is safe from it. Lest the record reflect acquiescence in some of the points of view expressed, I think we have to be reminded about the disastrous effects of a contaminated water supply. We can point to communities like Lowell and Woburn, Massachusetts, where they had children very sick. And while I think there is still some contest about whether it is directly attributable or indirectly attributable, the fact is that these kids got very sick. One youngster died that we know about.

In New Jersey, we had problems where the groundwater supply was so contaminated that the board of health in a particular community advised that when showering, the temperature not be too high and that windows be open to permit fumes to escape. The drinking water supply had to be replaced and household water had to be replaced.

So there is great danger. This is not a casual subject, and we are going to continue to press to get a decent legislative redress wherever we can and information, as we all agree, is a critical element in developing that sensible legislation.

The next panel consists of Mr. Erik Olson, Ms. Jeannie Jenkins, Ms. Linda Bruemmer, Mr. Roger Strelow.

I want to welcome all of you, and I would in particular like to say hello to Ms. Jeannie Jenkins, who represents the New Jersey Public Interest Research Group. NJPIRG has been at the forefront of efforts to protect our State's groundwater and I am pleased to have you with us today, Ms. Jenkins.

Ms. Bruemmer, Senator Durenberger is on his way. He wants to note the fact that, as a Minnesotan, he is pleased that you are here. He will have a chance to say that himself.

Sorry, fellows, there is nobody here to welcome you—but your testimony nevertheless will be listened to.

We will start the sequence with Mr. Olson. We ask you to adhere to a five-minute summary. Your written statement will be included in the record in full.

Mr. Olson.

STATEMENT OF ERIK D. OLSON, COUNSEL, ENVIRONMENTAL QUALITY DIVISION, NATIONAL WILDLIFE FEDERATION

Mr. OLSON. Thank you. I am Erik Olson. I am Counsel for the Environmental Quality Division at National Wildlife Federation. We thank this subcommittee for inviting the Federation to testify on the important issue of groundwater.

First I want to summarize some recent studies that have been done about the public's interest in this issue.

A report was issued this year summarizing several public opinion polls which concluded that public concern is rapidly rising on this issue. In 1988, 84 percent of the American public was "very con-

cerned" about fresh water pollution; 63 percent thought toxic waste problems were getting worse; and 70 percent thought that the Government was doing too little about solid waste.

Specifically on the issue of groundwater contamination, the majority of the respondents last year, 55 percent, thought that "most" underground drinking water sources were polluted, or that "as many underground drinking water sources were contaminated as were uncontaminated." This increased substantially since just 1981, when the percentage was just 28 percent. So we clearly see an increase in public concern about this issue.

We urge the subcommittee to recognize that while further education and research, as discussed this morning, clearly is needed, multi-year research programs should not be used as an excuse to avoid comprehensive groundwater protection legislation. In light of the fact that we are focusing this morning on the problem rather than legislation, I won't go into details; I will leave that for my written statement.

As the Nation ignores the "out of sight and out of mind" groundwater pollution problems, millions of individual pollution sources, ranging from leaking industrial lagoons to improperly operated backyard septic tanks, continue to spread their poisons. They pollute underground sources of drinking water and water that is the lifeblood of many sensitive aquatic ecosystems.

Cleaning up these polluted aquifers is extraordinarily expensive. At Superfund sites, for example, it costs from $21 million to $30 million on the average per site, and over $100 million at some sites. If you add that up with the fact that there are 30,000 sites on the Superfund list—as the Senator knows—being considered, and 1,100 already designated or proposed for cleanup, the figures for cleanup are already staggering. GAO has estimated that just at the DOE facilities, cleanup and upgrade is going to cost $155 billion.

So what we have is a national groundwater debt at Federal facilities and at Superfund sites; and frankly, this just represents the tip of the iceberg. We have a lot of other sites, ranging from industrial facility spills and leaks to hazardous substance stockpiles, sewage treatment plants, oil and gas production and refining waste, agricultural application of pesticides and fertilizers, and many others that cause contamination.

For this reason we must start to prevent contamination rather than just trying to clean up tomorrow the "Augean stables" that we have created. Prevention of such contamination is far preferable from the public health and environmental standpoint.

I just want briefly to summarize the extent of groundwater contamination.

As I mentioned, there are numerous sources. The USGS report, which I would certainly commend to the subcommittee's attention, really summarizes some of the problems very well. On page 6 of my testimony I discuss the USGS data just for one contaminant, nitrates, which is a very widely-found contaminant. USGS tested over 120,000 wells and found that 7,900 of those wells exceeded EPA's health standards, and an additional 16,300 wells exceeded the 3 ppm level which is considered to have human-based contamination. In fact, one out of five wells in the country exceeded the standard that USGS has set for human-based contamination.

Nitrate contamination can cause fetuses and also infants to lose their ability to absorb oxygen, causing "blue baby syndrome," and as I mention later in my statement, that has actually led to at least one death recently in the State of South Dakota.

There are several other types of contamination. I will update my statement with more recent information that EPA has provided in its statement today: 46 pesticides have been found in 26 States, causing widespread contamination. In addition, industrial contamination and other types of contamination are widespread. As I mention in my statement, some States, such as Kentucky and Pennsylvania, have found that 30 to 50 percent of their wells exceed the microbiological contamination standards established by EPA.

This has caused some significant public health problems. EPA has reviewed public health records and found over 52,000 people who became ill from 1971 through 1985 from acute chemical poisoning or from disease outbreaks. EPA and other scientists estimate that the actual numbers are probably far higher than that, perhaps as much as 25 times that level.

In addition, the number of chronic illnesses is probably very high, but we really have no idea how many there are. I have summarized two recent studies that just came out this year that have not received widespread attention. One is on spontaneous abortions caused by drinking contaminated groundwater, and the other is on several forms of cancer that are associated with contaminated groundwater near Superfund sites.

Both of those studies underscore the significant public health concerns that we believe lead to the need for Federal legislation.

I will just ask that the rest of my testimony be added to the record.

Senator LAUTENBERG. Thank you very much. I wouldn't mind if you read that conclusion on page 19.

Mr. OLSON. Thank you.

My conclusion is that there is really no justification for waiting for more studies before we begin to require protective measures to prevent groundwater contamination. Without such preventive action, a legacy of scarce, polluted groundwater may forever be impossible to clean up or use, and that will be our bequest to our heirs. We know enough to act; we should not miss the opportunity.

Senator LAUTENBERG. Thank you very much.

We are joined now by Senator Durenberger. I did welcome Ms. Jenkins, who is from New Jersey, and said that you would be here to welcome Ms. Bruemmer. That left two parties up there without anybody to greet them, but that's the breaks.

Senator Durenberger.

OPENING STATEMENT OF HON. DAVE DURENBERGER, U.S. SENATOR FROM THE STATE OF MINNESOTA

Senator DURENBERGER. Mr. Chairman, thank you very much.

By way of preliminary explanation as to why the Senator from Minnesota who has been elaborating for so many years on this subject was late in getting here this morning, I am also one of twelve members of the Senate panel which is trying the impeachment of Judge Alcee Hastings, and this morning at 9:00 o'clock Judge Hast-

ings took the stand in his own defense. So it has been very difficult for me to participate in both hearings.

I am grateful to you, Mr. Chairman, for permitting me to be absent from this hearing and in other respects from some of the deliberations of this subcommittee, of which I am a member, during this period of time.

But I could not miss the opportunity to recommend to you not just the testimony of Linda Bruemmer, but to recommend to you and the other members of this subcommittee and the full committee the resources of Ms. Bruemmer and the Minnesota Pollution Control Agency and in particular, the groundwater program they present to all of us who are committed to a comprehensive national groundwater program.

Linda Bruemmer is one of the leaders in developing the new Minnesota groundwater protection law, which Governor Perpich signed into law in May of this year. It is a sweeping statute. The State Legislature and the State officials who guided the development of the bill had to deal with many of the same questions which have come before this committee over the past several years and which will continue to come before this committee over the next few months: nondegradation as a goal; the use of best management practices; farmer liability for damage caused by agricultural chemicals; how to raise new funds to support a program; how to manage a cleanup program for pesticide contamination; how to split the turf between the pollution control agency, the natural resource agency, the agriculture department, and all of those internal political problems within a State government.

After going through a long and intensive legislative debate, Linda Bruemmer is now an expert on these issues, so I was very pleased when she agreed to come to testify at this hearing. I want to thank her and the other witnesses, whom I know by reputation, for the time that they are taking to share their views with us this morning. I certainly look forward to her testimony, with my regrets that I expressed earlier of not being able to share in the testimony of all the other witnesses as well.

Senator LAUTENBERG. Thank you very much, Senator Durenberger. You and I have worked together on many issues affecting the environment and the record, I'm sure, reflects your active and very serious interest in protecting our environment. We understand that sometimes there are duties, some of them very time-consuming like this impeachment process, that you must sit in on, and we miss your input and your guidance on these deliberations, but we will compile a long record for you to be able to read in the evening when you have some time on your hands.

We look forward to having your input. We are going to come up with a bill when all of this is over, and it is going to be essential that you and I work together.

Senator DURENBERGER. Mr. Chairman, can I make just one more observation? This is a tough subject because, as we all know, you can't see it. Ocean dumping and barges floating up and down all over the world and the Superfund issues—a lot of those things that you have dealt with so effectively on this committee are highly visible issues. They create good press, and it is really easy to turn a crowd out, even of Senators, for these kinds of issues.

Groundwater is boring. I mean, it is really very, very difficult. The most exciting thing we did in Minnesota, Linda and I and others in our hearings out there, was we had a mayor of a little town of a couple hundred people—I think it was Goodrich, Minnesota, as I recall—somehow or other, he was able to televise a well. He was able to put this television camera down a hundred and some feet into the well in this little town. This was the most exciting thing we had, showing groundwater leaking into the casing of this well.

That's about how exciting this subject gets. You've got to be tough and you have to be persistent; and I'll tell you, you have to care a whale of a lot about how little people in rural communities know about what happens when they turn on spigots in order to turn them on to this subject.

So I compliment you for your willingness to do this.

Senator LAUTENBERG. We're going to do it. We don't find it boring and I'm sure the people at the table don't find it boring. The last panel may have found it a little bit boring but they were from Government. I say this without personal criticism; it's just a difference of view.

But one of the things that keeps my interest piqued on this subject is that I remember the parents of children from Massachusetts who sat at that witness table and told us about how difficult life was as their children's health disintegrated. One child died, and I will never forget a statement the father made about when the other child in the family said, "How come in our house we don't laugh and we don't have good times? I know Jimmy's sick, but gee whiz, we ought to have some fun anyway."

I remember that, and we remember our responsibilities which you and I take very seriously.

We can go ahead and hear from the rest of the witnesses. If you like, I can call on Ms. Bruemmer first unless you have to get right back.

Senator DURENBERGER. It would certainly be helpful to me if you could, Mr. Chairman.

STATEMENT OF LINDA BRUEMMER, SECTION CHIEF, PROGRAM DEVELOPMENT, MINNESOTA POLLUTION CONTROL AGENCY

Ms. BRUEMMER. My name is Linda Bruemmer, and I am Section Chief of Program Development in the Division of Groundwater and Solid Waste at the Minnesota Pollution Control Agency.

The purpose of my testimony today is to discuss Minnesota's new groundwater protection act. You have heard a lot about the problems of groundwater, and I'm going to talk about a solution that we came up with.

Two key strategies were developed in 1988 to help decide how to protect Minnesota's groundwater. Under the direction of the U.S. Environmental Protection Agency's Office of Groundwater in Region V, Minnesota used its 106 Clean Water Act funds to assemble the Groundwater Protection Strategy,[1] of which I have brought

[1] See pps. 155 and 158.

copies today. This gained the endorsement of the MPCA Citizen Board, an external advisory committee, the Environmental Quality Board, and Governor Perpich. Concurrently, the Environmental Quality Board oversaw preparation of a second strategy. This is "A Strategy for the Wise Use of Pesticides and Nutrients." [1]

The goal of these strategies is to serve as the blueprint for future groundwater, pesticide, and nutrient management activities at the State level, and also to help find the appropriate local role.

The new groundwater law establishes landmark water policies in several areas. The cornerstone of the law is the degradation prevention goal. We did start out as a nondegradation goal, and that wording did get changed through the hearing process.

In the past, the MPCA operated with regulations that included a nondegradation policy, but the groundwater protection strategy pointed out the need to extend this policy from the rule at the MPCA to all State programs beyond the PCA through the endorsement of the Minnesota Legislature and the Governor.

The bill is divided into 10 articles—this is a copy of it—which will now amend and augment existing law. A significant amount of the language deals with pesticide and fertilizer programs because legislators felt that these areas of regulation needed to be greatly expanded to provide adequate controls on agricultural chemical applications.

The major policy elements of the act are as follow, and I go through these just to show you the complexity of the bill and all the issues we had to deal with.

In addition to setting the State degradation prevention goal, it directs attention toward sensitive areas of the State's groundwater. It combines education, research, and regulations to prevent further contamination, dividing responsibilities between the State Department of Agriculture for fertilizers and pesticides, and the MPCA for all other pollutants. It directs the Department of Health to establish health risk limits for toxicants for which there are no Federal drinking water limits. It provides for the first time a system to track construction and abandonment of wells, and provides for a pilot well-sealing grant program with a 75 percent cost share of up to $2,000 per well.

It provides the State money for monitoring of public drinking water supplies as required under the Safe Drinking Water Act. It bans the use of new once-through cooling systems and assesses a fee on existing systems. It provides the authorities and staff needed by the Department of Agriculture to monitor and reduce contamination by fertilizers and pesticides.

It accelerates efforts to promote alternatives to chemicals based upon the concepts of sustainable agriculture and integrated pest management. State agencies are directed to use integrated pest management in the management of State lands.

It establishes a program for the collection of waste pesticides to help farmers dispose safely of banned or unwanted pesticides. It establishes a pilot pesticide container pickup program and bans nonreturnable pesticide containers by July 1st, 1994, to help keep from generating new pesticide wastes in the future.

It creates an agricultural/chemical incident response fund which will be set up in 1990, and gives the Department of Agriculture

access to the State Superfund account for cleanup. It provides for State grants to counties for completing and carrying out county water plans.

It accelerates research on the sensitivity of groundwater through regional geologic assessment and county geologic atlases. It calls for the coordination and integration of water data through the State Planning Agency, and provides State funding for the PCA's integrated groundwater information system, which is currently being developed under 106 grant money. It charges the Environmental Quality Board and a new Legislative Water Commission with the responsibility for coordinating and monitoring implementation of the legislation.

Those are just the highlights of the bill.

Finally, the law provides a balance in funding between general funds and fees, each contributing about half of the $14 million authorized. There is also a balance in the kinds of fees approved. Fees are charged on once-through cooling systems, well construction, driller licensing, and on the registration of agricultural chemicals and licensing of facilities, dealers, and applicators, these last fees to be phased in next year.

Thank you for this opportunity to present Minnesota's new groundwater law. I will be glad to answer any questions, and I thank you for your interest.

Senator LAUTENBERG. Thank you very much.

Next we will hear from Ms. Jenkins.

STATEMENT OF JEANNIE JENKINS, STAFF BIOLOGIST, NEW JERSEY PUBLIC INTEREST RESEARCH GROUP

Ms. JENKINS. Good morning. My name is Jeannie Jenkins. I am a biologist with the New Jersey Public Interest Research Group, the New Jersey PIRG. I appreciate the opportunity to testify today.

As you already know, approximately one-half of New Jersey's people, or four million people, are dependent on groundwater as a source of drinking water. Almost 90 percent of the 622 community water supplies in the State obtain all or part of their drinking water from groundwater sources. In addition, there are approximately 400,000 private potable wells.

Groundwater is also an important source of water for New Jersey's rivers and streams. In the southern part of the State, it is thought that groundwater discharges to streams contribute between 65 and 90 percent of the base flow to waterways.

As a result of intense aquifer use and increasing development, New Jersey has designated two areas of the State, covering five aquifers in nine counties, as water supply critical areas. In 1987, 18 billion gallons of groundwater were withdrawn from these critical areas for industrial use alone.

Measurable levels of synthetic organic chemicals have been found in 18 to 21 percent of the municipal water supplies in the State. Estimates of the number of contaminated private wells, which are currently unregulated, are at least as high. Approximately 5,000 municipal and private wells from 12 counties in the State have been identified as being significantly contaminated within the last four years. The entire groundwater or well fields

for seven New Jersey municipalities have been listed as Superfund sites.

New Jersey has 1,200 known or suspected hazardous waste sites, and State officials estimate that between 2,000 and 3,000 additional sites need investigation. Some 800 industrial facilities are currently required to monitor discharges to groundwater under the New Jersey Water Pollution Control Act, and 20 percent of these facilities are thought to require long-term groundwater remediation. Several hundred reports of spills to land and water by industrial facilities are cataloged each month in the State. Further, the Department of Environmental Protection estimates that 15,000 industrial facilities in the State may be subject to cleanups, including groundwater remediation, under the New Jersey Environmental Cleanup Responsibility Act.

A preliminary survey by the New Jersey DEP examining pesticide and nitrate levels in potable wells near agricultural areas in the State found pesticide residues in one-quarter of the potable wells monitored, and elevated nitrate concentrations in one-third of the wells.

The cost of protecting groundwater supplies has never been accurately calculated. However, it is clear that prevention is always less expensive than the cost of cleanup.

In examining the costs of contaminated groundwater, factors that should be considered in addition to the direct cleanup include medical expenses of workers and local residents, economic losses to industries such as fishing and tourism, and remediation of water for uses such as drinking water and others.

New Jersey has taken a number of steps to protect groundwater. The State has developed a groundwater monitoring program through expansion of the surface water permitting program, which has assisted in collecting much-needed information on groundwater contamination. This program is entirely paid by the facilities that are discharging to groundwater.

In addition, New Jersey has a wellhead protection program which has not progressed very far but which will serve to protect potable wells from pollution sources once it gets underway.

The underground storage tank registry program also has already begun to give us considerable information on the number and location of underground storage tanks in the State.

New Jersey is in the midst of mapping aquifers in the State and determining critical recharge areas. Obviously, this is central to being able to protect our water supply. In addition, we are also developing groundwater standards similar to those that are already adopted for surface waters.

While New Jersey has moved toward increased protection of groundwater, this State and the Nation must go further. New Jersey PIRG views a serious need for improvement in several areas if strong, protective groundwater policies are to be set forth.

First, we must have broad strategies to protect groundwater quality and quantity. In many cases, aquifers and sources of contamination cross county and State lines. In developing strategies, the regional impacts of local development pressures must be considered.

Second, a permitting program similar to that used for surface water dischargers must be developed. Discharge fees or taxes should be charged to facilities with groundwater permits, and the standards that are adopted should provide maximum protection for groundwater and place the cost of remediation on polluting facilities.

Third, we need a clearer focus on groundwater protection and consideration of toxics use reduction initiatives. The best way to prevent groundwater contamination is through the reduction of toxics use at the source. While end-of-the-pipe strategies play an important role in environmental protection, the long-term solution to the toxics problem lies in prevention.

In conclusion, New Jersey has one of the best groundwater programs in the Nation. This says as much about New Jersey's willingness to take the environmental lead as it does about the poor state of groundwater protection in this country. New Jersey, like other States, is dependent on high quality and plentiful supplies of groundwater for a variety of uses. Also, similar to other States, its groundwater is threatened from a multitude of sources. Perhaps the serious problems already facing New Jersey's groundwater will serve as a necessary warning to the rest of the country.

Strong, uniform protection of groundwater should be provided through Federal legislation. Regional approaches to groundwater protection should be encouraged. The tremendous costs of groundwater remediation argue strongly for increased attention to be placed on prevention as the long-term answer to groundwater protection. Disincentives to pollute and increased emphasis on reducing the use of toxics at the source will be crucial to a successful groundwater protection strategy.

Thank you very much.

Senator LAUTENBERG. Thank you very much.

Now, Mr. Strelow, if you would, please.

STATEMENT OF ROGER STRELOW, VICE PRESIDENT, ENVIRONMENTAL PROGRAMS, GENERAL ELECTRIC; CHAIRMAN, GROUNDWATER TASK FORCE, NATIONAL ENVIRONMENTAL DEVELOPMENT ASSOCIATION

Mr. STRELOW. Thank you, Mr. Chairman. I am Roger Strelow, Vice President of General Electric for Environmental Programs, and Chairman of the National Environmental Development Association, or NEDA, Groundwater Project. I might add also that my own experience includes a background at EPA as Assistant Administrator for Air and Waste Management, and I currently serve on the board of directors of Clean Sites, Inc., a partnership of industry and environmental organizations dedicated to prompt and effective cleanup of hazardous waste sites.

The project is a broad-based coalition of diverse industries—manufacturing, electronics, chemicals, and a number of others—and labor interests, created to present balanced perspectives on solving the Nation's groundwater problems.

The NEDA Groundwater Project sees the need for better groundwater protection. I think there is no question of that. Along with virtually every other major group that has reviewed the ground-

water problem, such as the Energy and Environmental Study Institute, the Conservation Foundation, and the National Research Council, NEDA and the Groundwater Project support what we describe as a new State-Federal partnership to deal with this problem. The emphasis that we put on looking forward is on the State role, and let me explain why because I don't by any means want to suggest that we don't view the Federal role as a major and important one.

We start with a recognition that in this area, prior to having any comprehensive legislation dealing with groundwater, we already have some major Federal legislation which you and others on this committee are responsible for enacting. The Superfund law, the Resource Conservation and Recovery Act, and the Safe Drinking Water Act are the principal ones where, in many ways, the Federal Government is making a major and important contribution to protecting and cleaning up where appropriate the Nation's groundwater resources.

If you look at what is now needed, it appears to us that this falls largely into two categories. What we think the Federal Government needs to do more of and better is providing information. You heard the Federal witnesses in the first panel all acknowledge that there is very limited—certainly inadequate—information on groundwater conditions today. That simply must be improved. There must be better research on those conditions and on technologies for preventing further groundwater contamination, and various types of guidance to State programs.

But the other thing that we think is very much needed is a State lead in filling out the total regulatory structure. We are now dealing largely with waste management and waste disposal types of activities, but of course there are many other major impacts on groundwater, everything from septic tanks to road deicing to agricultural practices. These practices vary enormously from one part of the country to another.

Therefore NEDA and these other groups that I've mentioned have, I think, uniformly concluded that there needs to be a particularly strong State role in kind of filling out what remains to be done, to a large extent, in the regulatory structure. States like Minnesota and my own State of Connecticut are already doing a lot in that respect. There are other States in a leadership position, but this is not uniform and we think one of the major goals of the committee and the Congress ought to be to see that this State activity is stimulated and undertaken.

In looking at this State-Federal partnership, we all need to recognize that we are entering a new era, I think, of environmental legislation and management. We have certainly seen some successes, but also many shortcomings in some of the current regulatory approaches embodied in some of the established legislation. We have all tried our best to enact and support effective legislation, but we are now seeing interest in new approaches by the Congress and elsewhere on incentives and disincentives, trying simply to find the methods which work best and most effectively to get these important environmental goals achieved.

So we encourage this committee and the Congress as a whole to look carefully at some innovative methods rather than necessarily

just rushing right down the past of some of the past legislation where it has not been as effective as it might be.

One thing that I should add to what I have already indicated about the Federal role is that in giving a strong State lead, on the one hand there is no question that groundwater, because of its very slow movement and because of the size of many of the aquifers we're dealing with, tends to be somewhat more localized than other problems, but there are many true interstate situations. In my own home State of Nebraska with the Ogallala Aquifer, one of the major interstate aquifers that exists and needs attention, there will be interstate issues of regulation where clearly, if there are differences between or among the States, it would be appropriate to have the Federal Government be able to step in and ensure that effective cooperative action is taken.

The NEDA Groundwater Project supported groundwater research legislation along with a number of Washington industry groups in a June 20th letter that we sent to both House and Senate Members. NEDA supported last year's H.R. 791, which was a research bill, as well as the fundamental provisions in S. 20, the bill of which Senator Moynihan of this committee was the principal sponsor and which we felt in very large measure set the right tone for this type of partnership that I've talked about. So we have been on record that we think a combination of some of the basic elements of S. 20 and the House research legislation would provide an excellent framework to really move substantially ahead of where we are now.

That is the basic thrust of my remarks. Thank you.

Senator LAUTENBERG. Mr. Strelow, you agreed with the first panel that more information is needed. But lack of information didn't prevent them from drawing conclusions, so it is fairly obvious that if you have insufficient information and still draw conclusions, that sort of dampens the value of the recommendations as far as I'm concerned. I raised the question about bottled drinking water and neglected to talk about the faucet filtering systems that people buy, the ones with charcoal refills. People are generally frightened; they don't believe that groundwater supplies are of sufficiently decent quality that they can rely on just a glass of tap water as being something that is good for them or their families.

Part of what we will be doing, as we finally design the legislation, is trying to get some balance between a reliable data base and conclusions that we draw to make certain that we are adhering to a standard that a civilized and developed country that is rich in resources should have for its citizens. These are basic things.

One of the results of the Superfund law that we wrote in 1986 in the right-to-know section of that is to suddenly shock everybody, including businesses and people in the communities and government, as to the quantity of material that is being discharged into the air and the water and the ground. This is kind of consistent. By the process of our very habitation, we are threatening the resources that sustain us.

So, speaking for myself as one Senator and in a chairman's position, I am a lot less than satisfied with just developing data bases and saying, "Okay, now we have information and we hope people

will abide by it." We are going to do whatever we can to protect the citizens in the communities.

Mr. STRELOW. Mr. Chairman, I agree with that. We certainly agree that the state of groundwater today and the prospects for future impacts definitely warrant stronger action. Certainly, from our standpoint—I can't speak for the Government witnesses that you alluded to—but from NEDA's standpoint the desperate need for more information is not viewed by us as a reason not to take further action. A part of that action ought to be to get the information, but that is by no means all——

Senator LAUTENBERG. That's only step one. That can't be an end unto itself.

Mr. STRELOW. Exactly.

Senator LAUTENBERG. Mr. Olson, we heard from the EPA witness that a list of sources of contamination are now addressed by the EPA. Your testimony points out the many sources of contamination that are not addressed. Do we need a comprehensive approach to these remaining sources of groundwater contamination?

Mr. OLSON. Well, what we have right now is a patchwork of legislation. We do have RCRA, which focuses predominantly on hazardous waste disposal in subtitle C, and then there is also a nonhazardous waste disposal provision, as you are well aware, that offers a certain amount of protection for some municipal landfills.

We also have subtitle I, which deals with underground storage tanks. There is an underground injection control program.

But again, this is only a small subset of the major sources of contamination. There are numerous sources of contamination that are simply unregulated at the Federal level and poorly regulated in many States. You could cite things like fertilizer application—very widespread use, virtually no regulation. Pesticide application—again, there isn't much regulation from the groundwater protection standpoint to date. I have listed many other sources for which there is little or no real regulation at the Federal level, and many States, perhaps unlike Minnesota and New Jersey, really have not done very much.

Senator LAUTENBERG. Septic tanks are still an accepted structure for getting rid of waste materials. There is not, in my view, any rigid definition in many cases of what ought to be put into those tanks and, what happens when their life cycle expires?

Mr. OLSON. That's right. The estimate is that there are around 25 million septic tanks, and about one-third of them are operated improperly. So we are talking about around 8 million septic tanks nationally being improperly operated.

It is not just the big boys or the big girls that are violating these standards. It's also you and me.

Senator LAUTENBERG. Yes. Each one of us makes a contribution. That's unfortunate.

I assume you would agree that there is a need for Federal leadership to develop programs to address these remaining sources?

Mr. OLSON. Well, frankly, I have been spending the last three years writing a book on each State's groundwater protection programs. As I look at each State, it is phenomenal how those State programs track what is required by Federal law. There are some States that are out ahead—maybe 5 percent of the States—that are

really on the ball, then there is another 10 or 15 percent that are way behind everybody else. But in every State that you look at, you will see that there is very little regulation of certain sources, where it is politically difficult to regulate them—septic tanks, agricultural application of fertilizers, and pesticides would fall into that.

So we believe that it is clear that there needs to be Federal leadership. Without that, 20 years from now we are going to look back with regret. Maybe we'll have to have a Superfund program to deal with one of the other sources that we're not currently regulating. Everybody will be clamoring for Federal dollars to do that cleanup, where 20 years ago they were opposing any legislation to require prevention.

Senator LAUTENBERG. We talk often about the ounce of prevention, but it is rarely done. Those are the long-term decisions that often aren't well made around here because they have a cost today with a benefit that you can't see for years. It is a perennial problem, especially in the area of environment, but it's true in all decision-making, whether it's in competition, educational standards, etc., but it is particularly obvious here.

Mr. Strelow, you heard Mr. Olson describe some of the sources of groundwater contamination not now addressed by Federal environmental laws. In your testimony you point out that existing laws—let me not put words in your testimony—are adequate; and as I heard your verbal testimony, it seems that you felt that not much more is needed, that we have to gather information.

Do I correctly summarize your views?

Mr. STRELOW. No, you don't, Mr. Chairman.

Senator LAUTENBERG. I heard your statement after your testimony, but I just want it to be clear on the record.

Mr. STRELOW. I think that the line we would draw is that we feel there is some very important and far-reaching Federal legislation already on the books that calls for Federal regulation. Now, even some of that is delegated to the States, as under RCRA, for example. We support the purpose of that legislation. We feel that it is a major anchor or foundation stone for a total groundwater protection structure that will involve Federal and State governments.

We are by no means satisfied that the total structure that currently exists between Federal and State governments is adequate to deal with the groundwater protection problem. We favor additional steps. What we feel should be the major emphasis, along with groups like the Conservation Foundation in their study on this subject, and the Environmental Energy Study Institute, is that if there is to be Federal legislation, it should largely set the framework within which States would be encouraged and supported financially to fill in many of the gaps that Erik mentioned. There are many sources that aren't nearly as well controlled, if at all, compared to industrial sources.

This is something that we in industry face a lot; under the Clean Water Act you have the same situation. To a large extent, industry is controlled to the Nth degree, and many other dispersed sources—such as septic tanks, just as an example—in the case of groundwater are not controlled at all, or very minimally, in many States.

So we favor moving much faster in that direction. We think an important Federal role is financial assistance to the States; and as in S. 20, for example, that financial assistance is tied to the notion that the State has to have an adequate groundwater program. We feel that bill provides for aid in a very effective way.

In addition to that, the additional information that the States and the Federal Government itself need to act more effectively, to really know where the problems are, should be provided. But as I mentioned earlier, we are by no means suggesting that you need a lot of information first before doing many things that we already know need to be done—for example, regulating categories of sources that are largely unregulated.

Senator LAUTENBERG. Is it appropriate to conclude that if we take Mr. Olson's organization's information as being accurate—the number of septic tanks that pose problems, for instance—is it likely, with the States having had the option forever to regulate these things, that there is so much failure around—I think one-third failed to meet an appropriate standard—that by just devising a standard, the States are going to take care of it? All of us suffer, whether it happens in my neighboring State of Pennsylvania, New York, Delaware, that if there is an abuse of groundwater, it eventually flows past my door and past our beaches and into our communities.

So the debate we often have here, which you heard my colleague from Idaho talk about, is whether or not the Federal Government has an observer responsibility, or whether it has a functioning responsibility to say, "Listen, that's our obligation. We're committed to protecting the health and well-being of our citizens, whether we do it with MX missiles or whether we do it with border guards or whether we do it with clean water and clean air and all of those things."

So I see a role here. Again, we are pleased to have you here; you represent a different voice, and we want to hear from all of you. You come from a Government background, now with industry, as a part of an organization that has as its mission a coordinated activity between industry and the community, getting a better environment. So we are pleased to hear from you.

But I want to be certain that we don't misread what you are saying. Are we in a position, by developing framework legislation and supplying some funding, to carry out the responsibilities that we have to make sure that our groundwater supplies meet the test of quality that we have to have to protect the health and well-being of our communities?

Mr. STRELOW. Mr. Chairman, there is no question that more needs to be done, that a number of State programs are deficient in one respect or another. We think that the most effective ways to stimulate improvements where they are needed—and they are, in many instances—is to provide assistance. As Erik mentioned, there's no question that when the Federal Government lays out a method of doing something, either sets standards or provides the information on the control technology, on the health criteria that should apply, that information is a vital resource to the States. They often do not have it on their own. So that is an important role for the Federal Government that it needs to perform better.

There is an important role in providing financial assistance to the States to improve and develop their programs. In last year's S. 20, the Moynihan bill, there is a very sound provision that says that States ought to have programs that cover their particular local needs, dealing with the problems that really exist. And the bill provides Federal funding if the States have adequately-developed programs. So you provide a very strong incentive there. The States need money in this area, and if they know they are only going to get the money if they have an adequate program, we think that will be a strong stimulus.

If you add that strengthened framework on top of the already strong framework dealing with industrial waste management, basically, through CERCLA and RCRA, then we think you will achieve the distinct improvement and strengthening of total groundwater protection which is needed and which we support.

Senator LAUTENBERG. I assume you would agree that these sources of groundwater contamination represent a hazard, a risk for the community, would you not?

Mr. STRELOW. Well, there's no question that many of the sources, if inadequately controlled and monitored, will present a risk. Right now we don't know how great the risk is in all cases. In some instances it is very obvious and in some instances it is less obvious, but there are numerous areas where it is simply prudent, for example, to have adequate controls on various activities, using technologies and practices that are well-established. Even without understanding the total risk you can take actions that are precautionary, and we support that philosophy. I think Federal environmental legislation has always had a precautionary philosophy, and we support a continuation of that.

Senator LAUTENBERG. So you are saying that we ought to have bulletins sent out by the Federal Government to be careful? I'm not sure where you are coming from. I hear you say that you are concerned about it, but at the same time stressing the fact that you'd like not to see too much involvement at the Federal level.

Mr. STRELOW. No, Mr. Chairman, what I'm suggesting—let me try to be very specific to clarify it.

I doubt that it would make a lot of sense to have uniform Federal standards on septic tanks. I have no doubt that septic tanks in many areas of the country need to be better controlled. I would think that the best way to get there is to provide the information and technical guidance that the Federal Government is in the best position to pull together on that; provide that to the States, which they don't now have; provide grant money which says, "You should develop septic tank controls using our guidance and our information where it is needed to protect groundwater, and if you don't, you won't get our grant money," and that's an incentive.

Senator LAUTENBERG. How do you feel, Ms. Bruemmer, about that? Do you want to comment on that? You're in State government.

Ms. BRUEMMER. Specifically about the septic tank issue, or just the need for legislation?

Senator LAUTENBERG. Well, let's talk about the septic tank issue.

Ms. BRUEMMER. I guess I would agree with Mr. Strelow, that septic tank regulations would be difficult to set on a national level.

Perhaps a cafeteria-style national groundwater program where you select the elements that are of the highest priority for your State and implement those would be appropriate.

Senator LAUTENBERG. Can you think of any other contamination sources that might require a bit more Federal oversight or involvement or regulation? Or do you share his view generally that what the Federal Government ought to do is try to establish a data base and supply some funds? Do you think the Federal Government has a role to play in attacking the sources of contamination and establishing standards for getting further involved with groundwater protection?

Ms. BRUEMMER. I think the Federal Government has a role in helping the States identify what those high priority problems are. My section within the Pollution Control Agency is Program Development, because that is part of our job, to figure out what those emerging sources of contamination are that we need to control. Septic systems—we've gone to the legislature in Minnesota several times with a project to assess the groundwater impact of septic systems, and it has been looked on as a rather boring proposal. We've gone to two biennial legislatures in a row to get an environmental assessment of scrapyards. We hear that there is a suspicion that there is some groundwater contamination under those; they are also an eyesore. Again, the legislature has said, "Well, that's fine and good, but I don't think that's very interesting."

So we are constantly coming up with those suspected contamination sources that we see a need to at least investigate and judge what priority they should have.

Senator LAUTENBERG. Mr. Olson, how do you feel about this?

Mr. OLSON. Well, I think one example is instructive. Think about the nonpoint source program and the Clean Water Act where we had exactly this debate perhaps 15 years ago or longer. The same debate actually went on; in my testimony I quoted something that could have come out of this hearing practically, on pages 11 and 12, of one industry official testifying that "the Federal Government shouldn't step in because the pollution problems are best handled at the State and local level where they know most about the problems." He was testifying on clean air legislation in 1967.

With the Clean Water Act nonpoint source program as an analog, we had this debate. We didn't make the tough decisions that probably should have been made in the early 1970s, and now the problem has gotten worse.

You do need a Federal framework. There are some types of pollution sources, like septic tanks, where you can't have a Federal permitting program with Federal standards like we would have for large industrial facilities. But what we view as important and what I talk about in my testimony is an approach that would be somewhat more flexible, where you would say for those multiple sources, where you're not going to have the Federal Marshals come in and arrest somebody because their septic tank isn't working—you've got to have some flexibility; but for the large industrial sources that very often are the problems for hazardous materials handling and so forth, those things really do need the more traditional RCRA-type approach or Clean Water Act-type approach.

So we view it as a continuum, ranging from the septic tank-type problem where you really do need some flexibility, up to the more traditional, fairly regulatory and permit-oriented approach to source controls.

We also think it is important to have national standards for the degree of groundwater contamination that is acceptable or that threatens health. Actually, we have come up with some very detailed proposals for that.

There are two other points I would make, and I think both of them have been alluded to by the Minnesota witness. One is that there is a real potential that State legislatures will not enact laws unless the Federal Government says that those programs have to be adopted. What I see repeatedly in looking at State programs is that where it is politically difficult to take on a local industry, it won't be taken on. Sometimes it is politically difficult because of competitive reasons, for example, one might not want to lose the plant—the Syntex Fibers or whatever plant is in your area. Unless you have strong national requirements, there can be a very real blackmail problem where the company says, "We're just going to up and move next door if you crack down on us as a groundwater pollution source." You don't have that problem if you have comprehensive national legislation.

So again, we are revisiting the debate that we had in the early 1970s on clean air and clean water here, in the case of groundwater. Perhaps because groundwater is out of sight and out of mind, it has taken so long to get to this point.

Senator LAUTENBERG. Ms. Jenkins, we would like to hear you comment.

Ms. JENKINS. I would also like to comment on the septic tank problem.

In the rural areas that are being rapidly developed, New Jersey has chosen in many cases to use septic systems as a way to avoid high density development, so that in many areas we have hundreds, and in some cases thousands, of septic tanks going in for both commercial and domestic use. There is no program at the State level that is looking at the impact of these individual sources of pollution or the effect that they have on groundwater, and it is because it is politically difficult to do that, that that program has not been established. I think that without Federal guidelines and Federal law you will not see those types of programs developed. They are just too politically difficult.

Senator LAUTENBERG. How about the emerging sources of contamination? Should the Federal Government have a role there? Or should we let States find their way through the maze? I think that at some point we have an obligation.

Ms. JENKINS. Yes, I think so. I think that the Federal Government should be very involved in that.

While the seriousness of any one problem in any one area will obviously vary, there are very few instances where all these emerging problems and existing problems do not exist. So I think the Federal Government should be quite involved in these programs and in deciding very early on how we control these sources instead of waiting until we are at the remediation stage before the Federal Government steps in.

Senator LAUTENBERG. Let me ask each one of you to respond to the next question.

What do you think is the most important action that the Federal Government can take to assist States in developing groundwater programs? Who wants to start?

Ms. Bruemmer.

Ms. BRUEMMER. I've been keeping notes here.

In the groundwater programs, I think the need for research on health risk limits really needs to be done at the Federal level. We've got recommended allowable limits that our State Health Department sets at the 10 to the minus 5 (10^{-5}) risk level, and we see the need for that support because that's definitely something each State should not have to do, to set limits for all those compounds for which there are not Safe Drinking Water Act standards.

The other side is to provide consistent funding for some of the existing programs. I mentioned the 106 grant that we've operated under. It has been wonderful for developmental activities. As an EPA person pointed out, it has been consistently funded for the last five years, but we have never known from year to year that it was going to be at a consistent level of funding. I think there has been terrific developmental work done under that grant activity.

Senator LAUTENBERG. Mr. Strelow.

Mr. STRELOW. I think I could largely endorse what has just been said. I might add a refinement to that, and I suspect you would agree, and that is much better technical guidance; that is, in looking at various types of activities that affect groundwater, it is clearly most cost-effective in general to have the Federal Government in a comprehensive way evaluate and specify the various types of both operating practices and technologies that might be employed to deal with those sources where they are problems, and then the States can take that information and that guidance and apply it as needed and adjust it to fit local circumstances if they need to.

But I basically endorse what the State of Minnesota has just laid forth.

Senator LAUTENBERG. Mr. Olson.

Mr. OLSON. I think there are three things that I would recommend. One is that there is a clear need for source controls nationally, be those through permits or through regulations or through something like waste minimization requirements.

Secondly, there is a clear need for groundwater standards. Senator Baucus asked GAO to do a study with which you are probably familiar which suggested that there is widespread difference among the States as to what is regulated at what levels, and it just doesn't make any sense to have 50 States out there doing the same research over and over again and coming to different conclusions.

Thirdly, I think monitoring and data availability are critical because in the States where there is good monitoring information and the public is informed of the fact that there is contamination—like New Jersey, where we have some fairly good data on some sources of contamination—that's where the public gets involved and there is political support for implementing a program. Where we don't know anything about the contamination problems, it is much more difficult to get strong regulatory programs or strong actions to reduce the contamination.

Senator LAUTENBERG. Ms. Jenkins.

Ms. JENKINS. I pretty much agree with those comments.

I think the need for strong standards is critical. We need a national policy on how we want to treat groundwater so that we don't end up with State pressures to discard some groundwater and make some other groundwater quite important.

We also need to put more attention on use reduction, on reducing our use of toxics. I think we also need improved monitoring and availability of information.

Senator LAUTENBERG. I will close by asking Ms. Bruemmer and Mr. Strelow whether or not each of you agrees with the need for Federal groundwater standards.

Ms. BRUEMMER. To actually set the numbers in law?

Senator LAUTENBERG. The development of standards. Do you think we ought to have a more rigid definition of what is acceptable quality for groundwater?

Ms. BRUEMMER. Yes, I do, because the safe drinking water standards are directed at public drinking water supplies as opposed to groundwater standards, which would take into account all those rural supplies, those wells that you talk about that are not monitored under the Safe Drinking Water Act. So I do feel there is a need for that.

Senator LAUTENBERG. Do you think so, Mr. Strelow?

Mr. STRELOW. We fully support the Safe Drinking Water Act framework for having Federal drinking water standards to protect health.

With respect to standards that might be developed to protect other uses, other than protecting public health, it would seem most appropriate to us to have the Federal Government specify the best information on what the effects are at different levels and the consequences of that so that the States then, depending on the particular uses that are appropriate for a given aquifer—if it's something in addition to drinking water quality, or if it's something other than drinking water quality, they will then have the best scientific data from the Federal Government as to what standards would be appropriate. But we don't think it would be appropriate to simply have a uniform Federal standard for, say, agricultural uses when those will vary and the States will have different judgments involved.

Senator LAUTENBERG. But if we're talking about groundwater quality—we're not now talking about sources. We're talking about the quality of groundwater. You are saying—again, I want to be sure that the record accurately reflects your view—you are saying that we shouldn't do this as a general thing but try to do it on a case-by-case basis?

Mr. STRELOW. No. What I'm saying is that wherever groundwater needs to be protected for drinking water purposes, either current or if the State estimates that they will need it for drinking water even though it is not presently used for that, drinking water health standards are Federal and should remain so. We support that.

If there is a need to go beyond drinking water standards, conceivably for some other use protection, we think the State ought to actually set the standard but should do so with the best information on the criteria, if you will, of what will protect what uses. That

should come from the Federal Government, but then the State has to decide what use they are going to protect. In other instances there are aquifers which, for example, because of severe natural contamination—salinity, for example, in some of the western States—there is no way that you could use it for drinking water, quite apart from any human activities. Then the State has to decide, "Well, what use are we going to achieve and protect?" They would use the Federal guidance and information in setting their particular standard.

But for health standards, drinking water, that should stay Federal.

Senator LAUTENBERG. Mr. Olson, would you respond to Mr. Strelow's remarks?

Mr. OLSON. I am very concerned about the use orientation that he suggests because right now, we don't use a lot of the groundwater that we may need 10 years from now or 15 years from now. To suggest that we're going to take some aquifers that we're not currently using for drinking water and not protect them as much, I think is a very dangerous approach because 10, 20, 30 years from now our grandchildren or children may come back and need that water and it will be extraordinarily expensive to clean up, if it can be cleaned up at all.

Senator LAUTENBERG. Thank you all very much for your participation. This was a good hearing. Worthwhile information was developed that will help us in our legislative pursuit.

This subcommittee hearing is adjourned.

[Whereupon, at 11:50 a.m., the subcommittee was adjourned, to reconvene at the call of the Chair.]

[Statements supplied for the record follow:]

STATEMENT OF
OF
REBECCA W. HANMER
ACTING ASSISTANT ADMINISTRATOR FOR WATER
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON SUPERFUND, OCEAN
AND WATER PROTECTION
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

August 1, 1989

Good morning, Chairman Lautenberg, and members of the Subcommittee. I am Rebecca W. Hanmer and with me today is Marian Mlay, Director of the Office of Ground-Water Protection of the Office of Water of the U.S. Environmental Protection Agency. We are pleased to be here today to talk about the extent and nature of ground water contamination.

The importance of protecting ground water quality is increasingly recognized, not only in protecting sources of drinking water, but also with regard to ground water's other beneficial uses, such as its use in agricultural production, mining, and manufacturing. About one-fourth of all the fresh water used in this country comes from underground. Ground water currently supplies drinking water for 50% of the population, or 117 million Americans. It provides 35% of the drinking water supply used in urban areas and 95% of the supply in rural areas. One-third of the water used for irrigation in this country is drawn from underground. The agricultural states of Arkansas, Colorado, Kansas and Nebraska use over 90% of their ground water withdrawals for agricultural activities. For the eastern industrial states, 30% of the ground water withdrawn is for use in industrial processes.

Given these uses, and especially the importance of ground water for drinking water supply, this is a valuable natural resource that needs to be protected.

Ground water also has important ecological functions. Ground water and surface water are often interconnected. Surface water provides recharge for certain portions of underground aquifers. Many pumping wells, for example, induce infiltration from neighboring streams, lakes, and wetlands. In many settings, ground water maintains the base flow of streams, wetlands, and other aquatic ecosystems. In coastal areas, careful management of fresh water ground water supplies helps prevent saltwater intrusion into potable aquifers. In addition, the quality of ground water is important in maintaining ecosystems, including those supporting endangered species. EPA has a study underway to further explore these relationships.

EPA addresses ground water contamination under the authority of many existing Federal environmental statutes. For example, under the Safe Drinking Water Act EPA protects the nation's drinking water by setting drinking water standards, and we protect the water entering public water wells through the Wellhead Protection Program, and we control underground injection of hazardous wastes and other fluids. Under the Clean Water Act, we assist the States in developing and implementing State ground-water protection strategies. These strategies will increasingly be integrated with the Section 319 nonpoint source control programs,

as these programs are developed. Through the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), we control the availability and the use of pesticides which may present an unreasonable risk to human health or the environment as a result of leaching into ground water. Under the Resource Conservation and Recovery Act (RCRA), we control hazardous wastes from hazardous waste facilities, municipal landfills, surface impoundments, and underground storage tanks through which pollutants can leach into ground water. Under the Comprehensive Environmental Response, Compensation and Liability Act (Superfund), EPA has authority to clean up current and past releases of hazardous substances.

Although we are constantly expanding our understanding of the extent of ground water contamination, we may never have a complete understanding of it. However, I would like to make three important observations that must be kept in mind when discussing ground water contamination.

First, there is no national crisis of ground water contamination at this time, although there are serious problems in a number of localities. This means we have the opportunity to move at all levels of government, in the private sector, and in our communities to protect the resource by preventing pollution, not merely reactively cleaning it up.

Second, ground water contamination is a problem that has greatly challenged the ingenuity and institutional capacity of government at all levels. Driving these challenges is an

increasing public concern over ground water and the continual media reports in local communities from across the nation on incidents of ground water contamination from a variety of sources. There have also been an increasing number of committees, and agencies at all levels of government engaged in the debate on ground water contamination and policy. Further, the scientific and academic communities are increasing their interests and efforts in conducting research on ground water. However, there is a shortage in many areas of the United States of highly skilled scientists and technicians to collect and analyze the information needed to understand the nature and extent of ground water contamination.

Third, our current data on the sources of ground water contamination and its health effects are limited because ground water monitoring is expensive and technically difficult. These data have historically been gathered for only selected contaminants or sources and are usually for a specific purpose, such as the National Pesticides Survey of Drinking Water Wells we are now conducting for the purpose of evaluating the extent of pesticide residues in public and private drinking water wells and the relationship between ground water contaminants and different factors relating to ground water vulnerability.

Since 1984, EPA has had a Ground-Water Protection Strategy. Under this strategy, the Agency assisted States in developing ground water protection strategies with over $35 million, implemented an Underground Storage Tank Program, published a

proposed "Agricultural Chemicals in Ground Water Strategy" and assisted States with developing Wellhead Protection Programs.

EPA has decided to update its efforts to address ground water contamination with a new Ground-Water Task Force just chartered by the Administrator. Deputy Administrator F. Henry Habicht II is chairing the Task Force and the Task Force is comprised of select EPA Assistant Administrators and Office Directors as well as representatives from EPA's Regional Offices. The purposes of the Task Force will be: (1) to develop an Agency-wide strategy for the direction EPA will take in ground water protection over the next five years; and (2) to set out the principles and objectives that will guide our future efforts. The first meeting of the Task Force will be held in a few weeks.

WELLHEAD PROTECTION

The states are moving forward to implement the Wellhead Protection Program which this Committee had a strong hand in authorizing in the 1986 Safe Drinking Water Amendments. Twenty-eight states made submittals to EPA in June of their programs or plans and EPA will be reviewing them and working with the states over the next 9 months to finalize them. Wellhead Protection will prove to be an excellent mechanism for state and local governments to set ground water protection priorities.

CHARACTERISTICS OF THE GROUND WATER RESOURCE

Protecting the ground water resource poses significantly different problems than protecting surface water resources and air. First, the concentrations of contaminants released to ground water have much less opportunity to be reduced through dilution or mixing with cleaner waters than is the case with surface water. Indeed, the adsorption of contaminants or transformation to different contaminants is difficult to accurately assess. Ground water generally moves inches per day, whereas surface water generally flows at the rate of feet per second.

Second, ground water is not as easily monitored as are air and surface water resources. Taking a ground water sample may require drilling a well and the information obtained may be significantly different from that collected a short distance away from the sampling point. Also, ground water contaminant plumes are often hard to track without many monitoring wells. As a result, there is considerable debate over whether it is possible to characterize and establish the ambient quality or trends in ground water quality.

Third, protecting ground water involves controlling discharges from millions of sources including underground storage tanks, hazardous waste landfills, agricultural chemicals, and septic tanks. Thus, the potentially regulated community contains countless large industries, small businesses, farmers, and individuals. In contrast, to protect air quality and surface

water, while there are numerious small sources, major gains can be made by addressing a much smaller number of large sources.

Finally, for surface water and air resources, stopping the source of contamination usually enables the remaining contaminants to be diluted and transported from the area. In contrast, ground water pollutants may adhere to soils and aquifer materials or they may be chemically transformed into more dangerous compounds. Consequently, steps must be taken to prevent the movement of contaminants into drinking water supplies.

ANSWERS TO THE SPECIFIC QUESTIONS POSED BY THE SUBCOMMITTEE

The questions you presented to EPA in your letter of invitation are very interesting and clearly are questions the Agency has been investigating for many years. I would like to take this opportunity to provide you with EPA's answers to the specific questions you have asked.

Q1. <u>What is the seriousness and extent of the ground water pollution problem?</u>

Until recent years, ground water was generally considered to be a pristine resource. Both experts and the public alike believed that the subsurface waters were self-cleansing and that human-induced contaminants were restricted to sewage. However, it

is now known that ground water is contaminated by natural as well as man-made contaminants.

We know there are many natural contaminants in ground water which are not controllable by prevention actions. Some examples are chlorides, radon, selenium, arsenic, radium, fluoride, sulfates, iron, and manganese. These constituents are derived most often from the aquifer materials themselves.

In the late 1970s and early 1980s, releases from waste sites such as Love Canal and the "Valley of the Drums," together with pesticide incidents, such as releases of EDB, and the growing reports of drinking water well closures, slowly focused the public's attention on ground water contamination. Today, we are aware that high concentrations of some man-made chemicals, in particular synthetic organic compounds, have been found to exist in ground water at numerous sites throughout the nation.

The seriousness of ground water contamination can be viewed from two basic perspectives. The first perspective relates to the general overall quality of all ground water in the country. The second perspective concerns the question of what the likely risk is of human exposure to contaminants in ground water. From the first perspective, one would take a broad view of all ground water, measure the quality and make a judgment about the seriousness of contamination.

From the second perspective, one would look at current and potential ground water that the public uses for a variety of

economic and social purposes. The clearest example of this latter perspective concerns the quality of drinking water.

Although we may never have a complete picture of the nature and extent of contamination, each State has reported to EPA that at least some contamination exists of its ground water. However, looking at the quality of ground water from the second perspective, as noted above, the best indicator of ground water contamination comes from several EPA studies of drinking water drawn from ground water:

- A 1983 survey of volatile organic compounds (VOCs) showed that 2.5% of all public drinking water systems exceeded proposed standards for VOCs, and that 20% of all public water systems, and 30% of those in urban areas, contained at least trace levels of contamination.
- In 1984, EPA reported that 4 1/2% of public water supplies from ground water exceeded one or more EPA drinking water standards for inorganic substances and that 10% was in violation of drinking water standards for microbiological contaminants.
- A recent compilation of EPA data collected from the States shows overall that approximately 12% of ground water-based public drinking water supply systems in each year from 1984 through 1987 had one or more Maximum Contaminant Level (MCL) violations. This percentage has been decreasing but will likely increase in the future as EPA promulgates new MCLs

under the 1986 Safe Drinking Water Act Amendments. EPA has already promulgated 15 standards pursuant to those amendments.

Information on particular sources of contamination also adds to the mosaic. In 1988, EPA released a compilation of information from the States showing that detectable levels of 46 different pesticides were found in the ground water of 26 states as a result of normal agricultural use, and that 74 pesticides from all sources (including spills) had been detected in the ground water in 38 States.

Furthermore, EPA is conducting a National Pesticide Survey of Drinking Water Wells for which a draft report will be available in the fall of 1990. This survey is a statistical study designed to evaluate the occurrence of pesticide residues in drinking water wells nationally. EPA has now completed sampling of about one-half of about 1,350 wells for 126 pesticides and their by-products as well as nitrates and nitrites.

We cannot report specifically on the extent of ground water contamination nationwide and will likely never be able to do so given the costs and the inherent problems of monitoring ground water. But, we are obtaining more and better information, conducting more research, and developing new methodologies to better detect ground water contamination.

Q2. <u>What are the most significant sources of ground water pollution, including those now regulated by Federal laws and those not now regulated at the Federal level?</u>

On a volume basis, most of the ground water deemed unuseable for human consumption is a result of natural levels of dissolved solids, due to gradual chemical erosion of aquifers. Thus, nature itself is limiting the amount of useable ground water.

In 1984, the Office of Technology Assessment listed 175 organic chemicals, 50 inorganic chemicals, and various biological organisms and radionuclides that have been found in ground water throughout the nation; and this is likely not a complete inventory. Many of these contaminants are man-made and are of great concern to the EPA.

The sources of these natural and man-made contaminants number in the millions. In the same 1984 Office of Technology Assessment report, six categories of sources of contamination were listed: (1) sources designed to discharge substances, e.g. injection wells; (2) sources designed to store, treat, and/or dispose of substances, e.g. landfills; (3) sources designed to retain substances during transport or transmission, e.g. pipelines; (4) sources discharging substances as a consequence of other planned activities, e.g. pesticide applications; (5) sources providing a conduit or inducing discharge through altered flow patterns, e.g. production wells; and (6) naturally occurring sources whose discharge is

created and/or exacerbated by human activity, e.g. saltwater intrusion.

We are just beginning to understand that the highly publicized waste disposal sites are not the main source of contamination; non-waste practices such as the application of pesticides and leaking tanks may, in fact, account for up to two-thirds of ground water contamination.

Under the six categories listed in the OTA report, 33 sources of ground water contamination were identified. Out of those 33 sources, the Federal government regulates or otherwise addresses the following: 5 to 6 million underground storage tanks; millions of pounds of pesticides; approximately 29,000 hazardous waste sites; an estimated 500 hazardous waste land disposal facilities and 16,000 municipal and other landfills; some of the 180,000 surface impoundments; hundreds of thousands of underground injection wells; land application of wastes; radioactive disposal sites and nuclear facilities.

State reports to EPA clearly agree with us on the major sources of contamination to be addressed. The States have listed the following sources, based on individual state criteria, as their priority ground water contaminant sources:

- Underground storage tanks
- Abandoned hazardous waste sites
- Agricultural activity
- Septic tanks

- Surface impoundments
- Municipal landfills

Taken together, over half of the States identified at least one of these sources in their top five contaminant sources. And these are the same sources that were identified by the States in 1986.

EPA has a wide range of activities, in addition to its regulatory programs, to address ground water contamination sources through direct action including setting drinking water standards (which often are used by States as reference points for their ground water protection actions), building state institutional capacity, providing technical assistance, overseeing certain State programs, carrying out research, and monitoring.

States and localities, with assistance from EPA, address the sources of contamination that are not federally regulated through direct efforts such as through legislation and local land use determinations as well as through developing and implementing strategies and programs. The States also carry out a number of Federal programs including enforcement of the Federal statutes aimed at protecting ground water.

EPA provides both financial and technical assistance to the States with funding assistance for State Strategy Grants funded under the Clean Water Act, technical assistance through the Wellhead Protection programs carried out under the Safe Drinking Water Act, and through technology transfer to States and

localities. In 1987, EPA released a report summarizing all of the Agency's activities that address the 33 sources of ground water contamination that were identified by the OTA report. It lists 270 activities (ranging from research to demonstrations to regulatory programs.) that result in ground water contamination for 25 of OTA's list of 33 sources of ground water contamination. Not surprisingly, EPA has a higher level of activity focused on sources that are directly regulated under EPA's statutory mandates.

Another way to answer the question of ground water contamination sources is to discuss the significance of sources in geographic terms, such as whether a source threatens public drinking water wells. Thus, a hazardous waste site that does not threaten any public drinking water wells may be less significant in a particular locality than, for example, the local dog pound, animal clinic, paint factory, or dry cleaning facility. We are learning through the local Wellhead Protection Programs that the most significant sources that can have an impact on a community are likely to be sources other than those typically dealt with at the national level, such as wastes from a chicken farm or even home pesticide spray services. Therefore, it may be more useful to examine the ground water contamination problem from the perspective of areas sensitive to contamination rather than by examining specific contamination sources.

Q3. What evidence is available concerning the health effects of ground water contamination from various pollution sources?

Clearly, contamination of drinking water used by current and future generations -- and associated with health risks -- is the major concern to the Agency. One hundred seventeen million Americans, or 50% of the population rely on ground water as their primary source of drinking water. Ground water supplies some of the 48,000 of the 60,000 existing public water systems, in addition to supplying 13 million individual private wells.

Under the Safe Drinking Water Act, the Agency assesses the occurrence of contaminants in drinking water coming from ground water and surface water by conducting surveys of public-water systems. Also, the Agency examines health data from other agencies and develops toxicological risk analyses of contaminants found in drinking water to set drinking water standards as required under the Act. As a result of the 1986 amendments, EPA will have established regulations covering 83 drinking water contaminants and will have at least another 25 under development by the end of 1991. The Agency also develops drinking water health advisories for contaminants for which there are no current standards. Thus, EPA has information on the health effects for known ground water contaminants of potential significance. In developing these standards, the Agency collects all available information on the health effects of the contaminant and does original research when necessary.

Based on the information developed through setting standards and developing health advisories, we know the following regarding the health effects of contaminated ground water that is used for drinking water:

- The populations served by untreated ground water supplies have 3.7 times as many cases of illness from biological contaminants as those served by treated ground water supplies. Gastrointestinal and viral outbreaks are the principal manifested health effects.
- Outbreaks due to ground water contamination grew over the last 15 years from 8 to 17 per year, and illness related to ground water contamination account for 28% of all reported water-borne diseases.
- Many organic chemicals are known to be both toxic and carcinogenic. Toxic effects may include impairment of the liver, kidney, and central nervous system. At the present time, no data are available on the toxicity or carcinogenic potency of numerous organics found in ground water.
- Inorganic contaminants such as metals, lead, and mercury can cause both acute and chronic effects. For example, nitrates can cause the illness known as methemoglobinemia, or "blue baby" in infants.
- Radon, a radionuclide, causes an estimated 500 cancer deaths per year by exposure through water and up to 20,000 deaths annually by inhalation.

The information available on exposure to contamination is very limited. Although we can identify the population potentially at risk in some cases, information on the risks posed by different levels of contamination in current and potential sources of drinking water is generally lacking. However, there is some recent information showing that significant numbers of Americans may be exposed to certain contaminants:

- From a compilation of data reported by States to EPA through the Federal Reporting Data system, up to 35% of the population of certain States lived in geographic locations served by ground water wells containing one or more violations in 1987. Forty-two states had less than 10%, and seven States had between 10% and 20%, of their population served by at least one contaminated well.

Currently, we do not have sufficient data to draw specific conclusions on the extent of the health risks posed by ground water contamination in this country. The ground water which supplies public water systems is generally not treated because many public water systems are relatively small; where there is water treatment, this usually includes a disinfection process, but this addresses only microbiological contamination. The Safe Drinking Water Act does not cover the 13 million private drinking water wells in this country. Clearly, the population relying on these wells is at risk of being exposed to contamination. And with half of the U.S. population reliant on ground water for their drinking

water, the potential human health impacts are important and prevention of source water contamination should be the focus.

Q4. Are there differences in the seriousness and extent of the ground water pollution problem from one area of the country to another and what seems to be the reasons for such differences?

Yes, there are three major factors. First, is the nature and extent of human activity such as agricultural or industrial production. Second, is the variability in sensitivity of the hydrogeologic system to contamination; for example, shallow vulnerable aquifers versus deep confined aquifers. And third, is the variability in public and private monitoring programs across the nation which provide us with a different understanding of the problem.

The man-made contamination of ground water may result from all aspects of human activities: agriculture, industry, transportation, commercial/retail establishments, domestic wastes, and resource exploitation. The contamination due to man has occurred for centuries, but urbanization, industrialization, and increase in population density have greatly aggravated the problem in some areas. Some general observations include:

- o agricultural activities, and therefore contamination by pesticides and fertilizers, are a concern throughout the nation's farm belt as well as in other major agricultural

centers, such as in Florida's citrus growing region and in California's agricultural regions.

- o the nation's industrial mid-west points to contamination by hazardous wastes from heavy industry and chemical/petroleum refineries, which is also prevalent in the mid-eastern states like New Jersey and Pennsylvania.
- o contamination by underground storage tanks and septic tanks may be most prevalent in the northeast, and with California having significant problems with underground storage tanks from disposal or leakage by high-tech industries.
- o oil and gas contamination is primarily located in the oil producing states of Texas, Oklahoma, and Louisiana.

States confirm these observations in their reports to EPA. In addition, the States also report that some sources of high priority, such as surface impoundments and municipal landfills, are concentrated in urban areas rather than rural areas.

Q5. <u>What are the costs of ground water protection, relative to the costs of cleaning up ground water contamination?</u>

Ground water protection is usually less costly than cleaning up after contamination. Preventing a problem before it starts, or gets worse, is generally sound public policy. In addition, in the case of ground water contamination, it is clear that cleaning up ground water in most cases is extremely expensive.

A 1988 study of Records of Decisions at 153 Superfund sites shows that costs at close to one-quarter of these sites were over $10 million with the most expensive being $120 million.

Another example of the costs associated with contamination is the case of Prices Landfill in New Jersey. At this site, a municipal wellfield of ten wells was abandoned due to contamination and a new wellfield of nine wells was established for a cost of about $5 million or about $555,000 per well.

On the other hand, the public cost of prevention, including developing and implementing a local Wellhead Protection Program, can be significantly less. Communities with small supplies serving hundreds to thousands of consumers have implemented protection programs at the cost of perhaps 5% to 10% of the capital costs of well installation. In the larger well fields of South Florida, economies of scale translate to a cost of protection as low as 1% of capital costs.

One specific example of prevention costs and how they might compare to remediation or well replacement costs comes from Littleton, Massachusetts, a small city with a population of about 7,000 persons. The city spends about $100,000 per year on ground water protection costs. This program primarily includes data collection and interpretation through site monitoring at commercial and industrial sites with single and multiple wells as required by local law. The public water supplies for the city consist of four wells and they are now developing a new well for a cost of about

$1 million when land costs are included. With the new well, the city will likely be spending about $100,000 per year to protect the five wells valued at about $5 million. Therefore, if one well had to be replaced due to contamination in any year, it would cost the city ten times as much in that year as their entire protection program costs.

Clearly, we do not have definitive costs for prevention activities under the Wellhead Protection Program since it is a relatively new concept in this country. It is also difficult to directly compare the cost of operating a local protection program for a whole city or county to cleaning up a contaminated Superfund site since many Superfund sites may not be located in the vicinity of cities with these programs. However, we do believe that, in many cases, the cost of operating a protection program are generally less than the cost of cleaning up a contaminated site or replacing public wells or wellfields. It is also clear to us that a policy which prevents ground water contamination problems is viewed by both public officials and the public at large as sound public policy for protecting natural resources.

CONCLUSION

As discussed, EPA has sufficient existing statutory authorities to address ground water contamination. Through these authorities, EPA is moving forward with a wide range of activities

including standard setting, institution building, technical assistance, compliance, enforcement, research, and monitoring.

Mr. Chairman, this concludes my testimony. I would be pleased to answer any questions you or members of the Subcommittee may have.

Testimony of Dr. John N. Fischer
Acting Director, U.S. Geological Survey
before the
Subcommittee on Superfund, Ocean, and Water Protection
of the
Committee on Environment and Public Works
U.S. Senate

August 1, 1989

Introduction

Mr. Chairman, members of the Subcommittee, it is a privilege for me to appear before you today to discuss national ground-water issues. I am accompanied by Mr. Philip Cohen who is the Chief Hydrologist and manager of our Water Resources Division. U.S. Geological Survey programs represent almost half the Federal ground-water science and technology effort; and, as you would expect, we have a keen interest in the ground-water bills pending in this Congress.

I will provide testimony today in response to the specific questions posed to us in your letter of invitation to testify at these hearings. I will also provide some complementary information about (1) what the USGS does in the area of ground-water quality and how we coordinate our efforts with others; (2) the status of ground-water quality in the Nation; and (3) gaps in our knowledge base and the efforts we are taking to close those gaps. These matters relate directly to the interests of this Subcommittee.

Water Resources Mission of the U.S. Geological Survey

The USGS is a scientific, fact-finding agency that neither manages nor regulates the uses or quality of water. Our mission is to develop and provide information to a wide range of agencies and entities in both the private and public sectors, and to assist them in carrying out a wide range of water-related activities. Accordingly, the principal goal of the USGS's ground-water programs, a major subset of our total water-resources program, is to develop the scientific knowledge base to support activities of other Federal, State, and local agencies. The USGS is spending about $85 million a year on ground-water programs that include ground-water quantity and quality assessments; basic research in hydrology and hydraulics; research and investigations of the transport and fate of both organic and inorganic chemicals; technical assistance to Federal, State, and local agencies; and data collection and dissemination.

Major, ongoing water-related activities of the USGS include:

- Collecting hydrologic data on streamflow conditions at 13,000 stations;
- Collecting surface-water quality data at about 3,200 stations;
- Measuring ground-water levels at about 35,000 wells;

- Measuring ground-water quality at about 10,000 wells;
- Conducting a broadly based hydrologic research program on all aspects of surface- and ground-water quality and quantity;
- Managing a competitive, matching-grant program for non-Federal water resources research;
- Managing Water Resources Research Institutes in every State, three territories, and the District of Columbia;
- Managing the "National Trends Network," to determine precipitation chemistry in support of acid rain studies;
- Coordinating water-data acquisition activities of the Federal Government under the mandates of OMB Circular A-67;
- Providing water information "clearinghouse" functions through several long standing activities such as our National Water Data Exchange and Water Resources Scientific Information Center programs, and through our field offices located in every State;
- Preparing the annual National Water Summary (to which I will refer several times during this testimony);
- Compiling national water-use information; and
- Conducting pilot studies in the National Water Quality Assessment (NAWQA) program.

Many of these activities are carried out in cooperation with State and local agencies, who provide about $60 million to the USGS each year to conduct surveys, investigations, and research of mutual interest and concern.

Mr. Chairman, I would like to give three examples of how we support the missions of other Federal, State, and local agencies:

1. The USGS coordinates its water activities with the EPA under an umbrella Memorandum of Agreement which sets forth the scope of and relationships between our respective water-quality activities, including data collection and areal investigations, technical assistance, and research. This agreement has been in effect since August 1981, and has encouraged the regular exchange between scientists in the agencies and the joint participation in each other's technical meetings on ground water.

2. The USGS coordinates its water activities with the Department of Agriculture under a similar umbrella Memorandum of Agreement (in effect since April, 1988) which sets forth formal cooperation and agreement on research to expand knowledge on movement and fate of plant nutrients and pesticides in the subsurface, to establish methods to evaluate agricultural impacts on ground-water quality, and to transfer knowledge of improved agricultural management practices. The agreement is the basis for a recently formed bilateral Steering Committee on Water Quality which coordinates the USGS Mid-Continent and USDA Midwest Initiative programs of research on nonpoint source pollution from agricultural operations.

3. The USGS coordinates its water programs with State and local governments by means of joint-funding agreements that are renegotiated on an annual basis with about

950 State and local agencies as a part of the Federal-State Water Resources Cooperative Program.

Mr. Chairman, it might be helpful to you if I briefly describe the USGS's ground-water programs in New Jersey. Ground water is indeed of great significance to New Jersey's population. In fact, it provides the drinking water supply for about half the population of the State. The USGS has had a ground-water program in New Jersey for more than 50 years. At present, about 100 USGS scientists and support personnel reside in New Jersey and most of them work in our District office in Trenton.

The total annual budget for USGS water studies in New Jersey this year is about $7 million. Of this amount $4.5 million is spent on ground-water studies, including about $1.2 million provided to the USGS by New Jersey State and local agencies to support our cooperative ground-water work in the State.

Presently, our ground-water work in New Jersey focuses on four major issues -- (1) providing information on the quantity of ground water available for use in the State; (2) salt-water intrusion into New Jersey's ground water; (3) the occurrence of radioactive substances in the ground water; and (4) contamination of ground water related to human activities -- mainly contamination by manmade organic compounds.

Ground-Water Quality in the United States

Like many of our natural resources, ground water has been used and sometimes abused, without the consequences being fully understood or appreciated. Public officials and the general public began to express increasing concern about ground-water quality in the late 1960's when synthetic organic chemicals were discovered in ground-water-supplied drinking water in several States. Since then, contamination of ground water has been detected with increasing frequency, until it now affects every State in the Nation. Documentation of such contamination is provided in the "National Water Summary 1986" (USGS Water Supply Paper 2325), which describes ground-water quality on a State-by-State basis. The analysis provided in this publication was reviewed thoroughly by appropriate agencies in each State.

The National Water Summary reported that, despite the fact that ground-water contamination has been noted in every State, overall, the quality of the Nation's ground water was good. In virtually all the States, most of their ground water met State and Federal drinking-water standards and the quality of their ground water was suitable for most uses. In general, the bulk of the Nation's fresh ground water was found to be fit to drink.

This assessment of the Nation's ground-water quality was tempered by the fact that the State-by-State summaries were based largely on analyses of naturally occurring inorganic chemicals. The scarcity of data available on trace elements and man-made organic chemicals lead to the growing realization that these chemicals locally have contaminated shallow aquifers in many parts of the country.

Reports of contamination are likely to increase as the search for contamination intensifies and as more sophisticated analytical techniques are used to detect trace amounts of these chemicals in water. While the presence of organic chemicals and trace elements in very small concentration in ground water may not necessarily imply a health or environmental threat, their presence does raise questions about the source of the chemicals and the possibility that concentrations might increase over time to toxic levels.

Naturally occurring substances found in ground water or the natural physical properties of the water also causes some ground water to exceed Federal or State drinking-water standards or to be otherwise impaired for certain uses. All States in the cited National Water Summary had some areas of naturally impaired ground water owing to one or more of the following causes:

- Organisms, such as bacteria.
- Metals and other substances, such as arsenic, boron, nitrate, radium, radon, selenium, and uranium, that are toxic to humans, livestock, or crops in relatively small concentrations.
- Constituents or properties, such as chloride, dissolved solids, fluoride, hardness, hydrogen sulfide, iron, manganese, and sulfate, that are not necessarily toxic but which can impair the usefulness of the water for certain purposes.

In terms of contamination caused by human activities, we know that high concentrations of contaminants are found in ground water at numerous small sites throughout the Nation, associated primarily with waste disposal, use of road salts, leaks from storage tanks and pipelines, or spills of hazardous chemicals. These localized sources represent a small but unknown percentage of the total volume of potable ground water in the Nation. There also are some large multi-county and multi-state areas in which ground-water quality is known to be degraded, generally associated with human activities such as production agriculture, use of lawn and garden chemicals, or domestic waste disposal. Certain of these contaminants are associated with adverse health, environmental, economic, and social impacts.

Gaps in Our Knowledge

Mr. Chairman, I have shared with you a brief assessment of the national ground-water quality situation as we see it, and would now like to speak to the issue of what we don't know. Although the gaps in our knowledge are wide in some respects, our progress in recent years has been significant. I refer you to the recent report to the Congress prepared by a subcommittee of the Committee on Earth Sciences of the Federal Coordinating Council for Science, Engineering, and Technology -- an arm of the White House Office of Science and Technology Policy. The report, titled "Federal Ground-Water Science and Technology Programs," describes ongoing Federal programs, but it also has a chapter on emerging issues and needs which includes statements from the four major Federal agencies with ground-water science and technology programs: namely, the Department of the Interior, the Department of

Agriculture, the EPA, and the Department of Energy, whose programs represent 50, 24, 10, and 7 percent of the Federal effort, respectively. Each agency has identified gaps in knowledge, from their perspectives. We discovered no inconsistencies among agency perspectives. The following is the USGS perspective on the matter.

The role of ground-water research is to improve the scientific knowledge base to allow informed analysis of alternatives in the management of ground water. These alternatives are of many kinds. They include national decisions about various activities that have the potential to pollute aquifers. They include regional decisions about the rate of withdrawal of water from a large regional aquifer (balancing demand for water against impacts on water quality and quantity). They also include highly site-specific decisions about the best way to develop a given well field, or choices about cleaning up (or not cleaning up) contaminated ground water. All of these decisions require several kinds of information --

1. Information about the current status of the resource;

2. Information about the hydrogeologic setting of the resource;

3. An understanding of the processes of ground-water storage and movement; transport of dissolved constituents; and chemical and biological reactions of dissolved constituents;

4. A set of analytical tools to predict the consequences of alternative actions on the future status of the resource;

5. Information about legal constraints affecting the decision; and

6. Information about the social values involved, such as the prevailing attitudes about risk and about preservation of resources for future generations.

The USGS is mindful of all of these types of information, and works actively to provide information on the first four to decisionmakers at all governmental levels. A great deal of progress has been made in recent decades in improving the quality and amount of this kind of information, but a great deal more is needed, especially because of the rapid changes in the kinds of ground-water management issues that our Nation faces. High-priority areas of research that are identified by the USGS include --

1. <u>The Development of Less Expensive Approaches to Analyzing Organic Contaminants in Ground Water</u>. Organic contaminants include pesticides and many solvents used widely in industry, transportation, and in the home. The process of collecting a representative sample in the field is difficult, and analyzing the sample in the laboratory is extremely costly (often upwards of $1,000 per sample). Often the results are difficult to interpret because of uncertainly about the behavior of the sample in the collection process versus its behavior in the ground-water system. Inexpensive indicators of organic contamination that can distinguish between natural and man made organics are needed in order to reduce the cost of research and site investigations.

2. Improving the Prediction of Long-Term Changes in Storage in Large Aquifer Systems. The analysis of the effects of large changes in the management of water (such as irrigation or artificial recharge) can result in large changes in the regional water balance. These changes are very difficult to observe, but new techniques involving atmospheric physics, isotope geochemistry, and other scientific disciplines may be able to lead to improvements in measurements and predictions of these important aspects of the hydrologic cycle.

3. Improvement in Understanding the Movement of Multiple Fluids in Ground Water and the Development of Efficient Computer Models. Many contamination problems involve liquids such as gasoline or industrial solvents that move with water but have different densities than water and mix with water to a very limited extent. Almost all of the study of ground water has concerned itself with the movement of the primary fluid -- water -- and the constituents that are dissolved in it. The interaction and movement of multiple fluids is poorly understood and needs a great deal of theoretical and observational work and more efficient computer models to predict the movement of contaminants in these multiple fluid situations. Several Federal agencies are pursuing research in these areas. The ground-water report to the Congress from the Federal Coordinating Council for Science, Engineering, and Technology, cited above, shows that over $190 million was obligated for transport and fate research and technology over the past 5 years, with the USGS, the Department of Agriculture, the Department of Energy, and the Environmental Protection Agency conducting 39, 22, 16, and 12 percent of the work, respectively.

4. Improved Three-Dimensional Characterizations of Ground-Water Quality. An accurate description of the quality of water in the three-dimensional ground-water system is necessary for management of the resource. However, it is difficult to accomplish because of the potentially large amount of variability of the ground-water system over small distances. This variability comes about because of: variability of aquifer materials; variability of the sources of contaminants across the land surface; and because of the physical, chemical, and microbiological processes that occur as the water moves through the aquifer. Understanding the causes of variability is necessary to be able to characterize large-scale systems. This work is still in its infancy.

These are a few of the research questions that now face the science of ground-water hydrology. We believe that progress on these questions will be of significant value in the management of the Nation's ground-water resources, and should be pursued in order to improve the Nation's understanding of the extent and seriousness of the ground-water pollution problem.

We would now like to respond directly to the questions posed in your letter of invitation for us to testify before you today.

Your first question is: What is the seriousness and extent of the groundwater pollution problem?

Ground-water contamination is not a new phenomenon of the past decade or two. There are documented cases of contamination of the resource through man's activities that date back centuries. However, the number of documented cases is growing. Rough estimates have been made that only a few percent of our shallow ground water is contaminated, based on quantities of waste generated and numbers of disposal, storage, and spill sites, but these estimates are difficult to confirm.

The degradation of our ground water has resulted from a variety of point sources. Many thousands of these sources exist in the country. Also, nonpoint source activities such as the widespread application fertilizers and pesticides in agricultural areas are known to contaminate ground water. Septic tanks, which in aggregate are another nonpoint source, alone discharge some 800 billion gallons of effluent to our ground water per year. The drinking water supplies for a substantial number of people in places like Long Island, New York; St. Louis Park, Minnesota; Barstow, California; and hundreds of other communities have been lost in recent years to ground-water contamination. In New Jersey alone, nearly 1,400 wells have been closed since 1970 due to contamination. It is clear that, at least locally, the problem is a serious one.

It continues to be very difficult to assess quantitatively the overall severity of the problem. Ground water is both difficult and expensive to monitor. For the other significant environmental media (air, rivers, lakes, and oceans) making the necessary measurement of the concentration and movement of contaminants is relatively straightforward. For ground water, we generally need to use an existing well or drill a new well to make a measurement. Using an existing well is often problematic because we may not know enough about the well to determine what part of the ground water we are actually sampling. Using newly drilled wells is very costly. It may cost many thousands of dollars to collect a single sample from a single point in this three-dimensional water-bearing material.

Over the past decade, the USGS has rapidly increased its efforts relative to the needs of Federal, State, and local governments for such information; and we are making significant progress toward improving the availability of information on ground-water contamination. However, we in the community of ground-water hydrologists have some distance to go before we can accurately assess the quality of ground water nationwide.

Your second question is: What are the most significant sources of groundwater pollution, including those now regulated by Federal laws and those not now regulated at the Federal level?

The major sources of ground-water pollution are of five generic types: (1) Intentional waste disposal activities, (2) accidental spills or losses of hazardous materials, (3) application of chemicals to the land's surface, (4) migration of polluted surface water

into ground water, and (5) creation and/or migration of naturally occurring hazardous substances due to changes in hydrologic conditions.

1. Intentional Waste Disposal Activities include sewage disposal lagoons, septic tanks, sanitary landfills, hazardous material disposal sites, and deep-well injection. Most of these activities are now covered by specific statutes although there are many facilities that were designed or operated before these statutes came into effect and have caused pollution problems that may remain for many years. Moreover, many of the technologies now used in the disposal of hazardous materials (for example, clay liners or caps on landfills) have been in use for less than 10 years and have not been put to the test of time. Therefore, although a great deal of progress has been made in improving the design and operation of waste-disposal facilities, the ability of many of these facilities to operate in a manner that does not cause pollution of ground water over decades has not been demonstrated.

2. Accidental spills or losses of hazardous materials, include leaks from gasoline, petroleum, or solvent storage tanks; breaks in pipelines; and accidents associated with the transportation of hazardous materials by truck or rail. For pipelines and underground tanks, potential or actual leaks can go undetected for a long time. There are numerous other kinds of spills associated with the use of various chemicals. Of particular note is the spilling of pesticides in concentrated form at the site of mixing on the farm or around the home. These spills sometimes occur close to wells because the well water is used for pesticide mixing. Spills near wells commonly are serious because the contaminant can move rapidly into the aquifer either on the inside or along the outside of the well casing.

3. The application of chemicals to the land surface include applications of fertilizers and pesticides to agricultural fields, forests, range land, lawns, gardens, and golf courses, as well as the application of de-icing compounds to roads. The fate of these compounds is determined by their chemical characteristics, the physical properties of the soil and aquifer materials, and the rate of downward movement of water in the subsurface.

4. The migration of polluted surface water into ground water. Most streams are hydraulically connected to an aquifer in the sense that there is a flow of water from the aquifer to the stream or from the stream to the aquifer. In those cases where the flow is from the stream to the aquifer and the stream itself is carrying some kind of dissolved pollutant, then the potential exists for that pollutant to enter the aquifer. Ground-water quality cannot be divorced from surface-water quality.

5. The migration of naturally occurring hazardous substances due to changes in hydrologic conditions include a variety of processes whereby naturally occurring saline waters (or waters containing harmful amounts of naturally occurring substances such as arsenic, boron, or selenium) migrate toward pumping wells as water is withdrawn from an aquifer. This is particularly common in coastal areas where saline water can intrude a freshwater aquifer, but it also occurs in many inland locations where fresh water overlies or is adjacent to saline water. Generally, this type of contamination can best be controlled by managing the overall development of the aquifer. Ground-water

contamination also can occur as a result of the infiltration of irrigation water, causing certain minerals in the soil to dissolve, and resulting in a build-up of salts in the aquifer.

Your third question is: What evidence is available concerning the health effects of groundwater contamination from various pollution sources?

Mr. Chairman, the USGS is not involved in the study of health effects of contaminants. I defer to my colleagues in those Federal agencies with mission responsibilities related to health.

Your fourth question is: Are there differences in the seriousness and extent of the groundwater pollution problem from one area of the country to another and what seem to be the reasons for such differences?

Ground-water contamination problems in the Nation are a function of many factors including the types of human activities that are carried out in a given area, the climate, the soils, and the hydrogeologic characteristics of the area. The problems not only differ in severity but also in kind. As our response to your first question suggests, the problems tend to be most severe in areas of more intense human activity. The USGS has prepared an extensive review of the ground-water quality conditions of each of the 50 States, based on existing data, in the cited National Water Summary 1986. A major conclusion that can be drawn from that report is the fact that there are a wide range of problems and limited information to accurately identify and quantify those problems on a national basis.

Your fifth and final question is: What are the costs of groundwater protection, relative to the costs of cleaning up groundwater contamination?

In most cases, prevention and/or source reduction is more cost-effective than cleanup. I defer to my colleagues in those Federal agencies with mission responsibilities related to prevention and cleanup for specific cost information.

Mr. Chairman, that concludes my formal testimony. I appreciate the opportunity to share our thoughts and concerns with you about national ground-water quality. Mr. Cohen and I will be pleased to answer any questions you may have at this time.

Statement by Robert W. Long, Deputy Assistant Secretary

For Science and Education

United States Department of Agriculture

Before the Subcommittee on Superfund, Ocean,

and Water Protection of the

Committee on Environment and Public Works of the

United States Senate

August 1, 1989

Good morning Mr. Chairman and Members of the Subcommittee. I welcome the opportunity to be with you this morning to discuss the seriousness and extent of groundwater pollution. In your letter of invitation to this hearing, Mr. Chairman, you note that there is growing evidence that the quality of groundwater is threatened by a wide range of pollution sources. Among these sources are agricultural chemicals, fertilizers, and animal wastes.

We agree that agricultural practices are a part of the groundwater contamination problem. You pose a good question when you ask about the extent and seriousness of the problem. While we generally know there are problems, it is difficult from the information we presently have in hand to pinpoint them. We can talk in general terms about potential problems in the corn belt, and in other farming-intensive regions. We can identify those issues associated with large concentrations of cattle, such as feedlots and in large dairy herd operations.

The Economic Research Service has released a study in 1987 that provided a broad perspective on potential costs of groundwater contamination and indicated regions of the country most vulnerable to pesticide and nitrate contamination.

We are presently working with the U.S. Geological Survey (USGS), and other Federal agencies to focus our research and technical assistance programs. USDA is currently investing approximately $140 million in these programs, and we anticipate a significant increase in Fiscal Year 1990. The Department, as a part of the President's Water Quality Initiative, has proposed increasing spending for water quality work to the level of $180 million.

I have included the specifics of the Department's part of the initiative as a part of my statement.

I would turn now to your question relating to the evidence of the health effects of groundwater contamination.

In evaluating the long-term delayed effects of contact, breathing, or ingesting agricultural chemicals, we prefer to use epidemiological studies.

Even though they often have a low degree of reliability, they are necessary and important tools for investigating and screening potential causes of health problems and for defining priorities for more detailed investigations.

The analysis of the relative importance of long-term health risks is further hampered by some limitations on the available test methods and procedures. For example, the inappropriateness of experimenting on human subjects has led to a dependence on extrapolation of the results of high-dosage, single chemical exposure tests on laboratory animals with little analysis of how the results of those tests actually related to human health or longevity in the context of multiple risks.

Nutrients, including nitrates and nitrites from both natural and synthetic sources, are present in the foods we eat and in the environment around us. In proper amounts, they are essential to life. When too little or too much is present, they can cause a variety of health problems, including serious illness and death. While overdoses of any of the nutrients commonly applied in agriculture, such as phosphorous, calcium, and potassium, can cause health problems, nitrates and nitrites are presently attracting the most attention because of the numerous examples of nitrates in groundwater.

We are aware of many other studies on nitrates and nitrites, including those done in Great Britain, Germany and Denmark. We would be pleased to share the information we have on hand with you and the Members of the Subcommittee.

Suffice to say, we recognize that agricultural practices do impact health, and we are diligently striving through research, education, and technical assistance programs to reduce the adverse impacts of agriculture on health and the environment. USDA has a number of research and Extension programs looking at ways to reduce chemical applications while preserving profitability. The Extension Service conducts Pesticide Applicator training programs to educate applicators as to the efficient and safe methods of using chemicals. Our technical assistance programs are geared to assisting producers to develop and implement farming practices which reduce health and environmental damage.

Mr. Chairman, we work closely with other Federal agencies such as USGS,and the Environmental Protection Agency in carrying out our programs. And, I am going to defer to these agencies in responding to your questions regarding regulation and the costs of cleaning up groundwater contamination.

I have with me today representatives of our program agencies, and we will be happy to respond to your specific questions. I indicated I would include specific details about the Department's portion of the Water Quality Initiative. I am most hopeful that Congress will provide the funds necessary to carry out this initiative as it addresses the most pressing problems we face with regard to water quality.

A significant portion of the water quality initiative is aimed at providing answers to the type of questions you have posed. The 1990 USDA program proposes to focus attention on research and data base development programs to provide the framework for enhanced technical assistance and education efforts to assist farm producers. Programs proposed in the budget will be carried out directly by USDA agencies and through State partners in the research, technical assistance and education communities.

A $13.9 million increase is sought for a coordinated research program to be conducted at Federal laboratories by the ARS and at universities through CSRS. The expanded program will build on the base of ongoing research in nitrogen and pesticide degradation in soils, sediment research, development of models and work on biological controls and integrated pest management. Research will be conducted through a systems approach, which will assure consideration of economic, environmental and social consequences of the improved production practices.

Specific major research objectives are to:

-- Determine the extent and seriousness of potential agricultural contributions to nonpoint source contamination.

-- Develop improved farm and ranch production systems to maintain and improve water quality, without sacrificing profitability.

-- Improve the understanding of fate and transport of agricultural chemicals in soils and water.

-- Develop less costly groundwater sampling techniques.

Much of the 1990 increase will fund research on management systems for farmers in the Midwest corn belt.

This project recognizes the concentration of corn and soybean production, wide use of nitrogen and pesticides in connection with conservation tillage and the potential susceptibility of soils in the region to contamination by chemicals. Work in this and other major agricultural production areas will build on the base of information already available and the results of work conducted under the initiative projects will be structured through a systems approach to facilitate transfer of the information rapidly to producers.

Information on pesticide use will be required to support efforts within USDA and other agencies to assess the magnitude of agricultural-related water quality problems and develop effective strategies for agricultural chemical management. The Economic Research Service, working with other agencies, will initiate projects to:

-- Estimate pesticide use by State, to analyze the effects of new management practices, to assess the impacts of pesticides on productivity and profitability, and to evaluate the consequences of pesticide regulations.

-- Develop computerized maps for analysis of land use in relation to soil characteristics and water quality.

-- Coordinate projects with EPA and USGS to cross-reference these data bases.

Long-term success of the USDA water quality efforts will be measured by adoption of cost-effective agricultural practices that maintain and improve water quality. The strategy to achieve this success includes funding to demonstrate new research results to producers at eight selected sites, resources to provide immediate technical and financial assistance based on available technology in priority hydrologic units identified through State water quality plans and other efforts to assure rapid technology transfer. Specific efforts include resources to:

-- Demonstrate state of the art technologies and farm practices in eight selected sites where agrichemicals have been detected in soils and waters at levels which impair usage.

-- Enable the Soil Conservation Service National Technical Centers and State offices to prepare agricultural and conservation practice standards, interpret soils information regarding the fate and transport of chemicals and application of water quality management practices. Extension will also participate with SCS in updating Field Office Technical Guides for the affected conservation districts to incorporate information on safe pesticide use and disposal, nutrient management, waste disposal, salinity reduction, and sediment control.

--Enhance the existing Pesticide Applicator Training materials to incorporate water quality considerations.

-- Provide technical and financial assistance to apply existing proven techniques to selected high priority hydrologic units. These areas will be selected from those identified in State plans developed under the Water Quality Act of 1987 where agricultural chemicals have been identified as non-point source contaminants. Emphasis will be on transfer of management strategies to prevent unacceptable groundwater contamination.

-- Expand ongoing technical assistance efforts in major regional projects to protect the Chesapeake Bay, Great Lakes, Tennessee Valley, Puget Sound, Gulf States, and the Colorado River.

– Continue important ongoing education efforts in pesticide and nutrient management, biocontrol and integrated pest management.

The initiative includes resources to strengthen USDA efforts to assess the economic impact of pesticides for regulatory decisions, maintain strong research programs on efficient and effective use of pesticides, sediment control and nutrient applications; develop and transfer to producers, integrated pest management applications and biocontrol systems and continue other related water quality efforts.

The Animal and Plant Health Inspection Service will continue to emphasize the application of biocontrol and integrated pest management technologies when technically and economically feasible.

The Forest Service incorporates improved land management practices where possible to minimize water quality degradation and assure compliance with environmental statutes. Chemical and sediment runoff mitigation projects are also conducted in connection with timber harvest activities.

Mr. Chairman, I am submitting for the record a copy of USDA'S Water Quality Program Plan which fully describes our proposed activities. I do appreciate your invitation to be with you today, and I will be pleased to respond to any questions you or the other Members might have.

WATER QUALITY PROGRAM PLAN

TO SUPPORT THE

PRESIDENT'S WATER QUALITY INITIATIVE

U.S. Department of Agriculture
and
Cooperating State Agencies

July 1989

PREFACE

The USDA Water Quality Program Plan to support the President's Water Quality Initiative was prepared by an agency work group appointed by USDA Agency Heads and coordinated by the Office of the Deputy Assistant Secretary for Science and Education.

Its purpose is to identify the objectives and procedures for the implementation of the USDA Water Quality Program Plan and to assure both internal and external coordination of the Department's water quality activities. The Report describes a schedule of 10 planned output-oriented and program support activities for the 5-year implementation period 1990-1994. This planned schedule is based on the expected extended availability of the President's 1990 funding proposal for the 5-year implementation period. It is a complex and challenging program whose success is dependent on sustained support.

Deputy Secretary
U.S. Department of Agriculture
July 1989

WATER QUALITY PROGRAM PLAN
TO SUPPORT THE PRESIDENT'S WATER QUALITY INITIATIVE
USDA AND COOPERATING INSTITUTIONS

EXECUTIVE SUMMARY

Background

USDA's response to the President's Water Quality Initiative brings a new focus and coordinated commitment to the goal of protecting the Nation's waters from contamination by agricultural chemicals and waste products applied on agricultural lands. The management of agricultural chemicals and wastes to meet environmental and public safety objectives is in many ways a new functional activity for USDA, particularly with its emphasis on groundwater contamination. It involves the capabilities and activities of more USDA Agencies, working in closer concert with a wider variety of Federal and State Agencies than any previously established Departmental function.

Objectives

USDA's overriding aim for the President's Water Quality Initiative is to provide farmers, ranchers and foresters the knowledge and technical means to respond independently and voluntarily in addressing on-farm environmental concerns and related State water quality requirements. The Department plans to achieve this objective in a way that reduces the need for restrictive regulation and in a manner that maintains agricultural productivity, avoids economic hardship and sustains an economic and safe supply of food and fiber. The Plan strives to: (1) determine the precise nature of the relationship between agricultural activities and groundwater quality; and (2) develop and induce the adoption of technically and economically effective agrichemical management and agricultural production strategies that protect the beneficial uses of ground and surface water quality.

USDA Water Quality Program Strategy

The USDA Water Quality Program will be carried out through three major, integrated and interdependent functional components: (1) Education and Technical Assistance; (2) Research and Development; and (3) Database Development and Evaluation.

(1) Education and technical assistance efforts will assist farmers, ranchers and foresters in applying new and improved agrichemical and waste management and agricultural production practices based on already available research results and new techniques, practices and systems developed through the research and development program component. The adoption of practices to reduce or prevent contamination will be encouraged and accelerated where existing or potential contamination of ground or surface waters from agricultural nonpoint sources has been identified as a public concern. Demonstration projects will be established in some of these areas and enhanced education, technical and some financial assistance will be provided in others beginning in the first year of the Program. Practice adoption will begin in the first year and accelerate in the subsequent years. Education and technical assistance will be provided for agricultural chemical management and production practices that are needed to meet State water quality requirements under Section 319 State water quality plans based on State-identified priorities, and for the specific water quality goals of multi-State regional water quality projects. Where appropriate, particular emphasis will be placed on agrichemical nonpoint sources of groundwater pollution.

(2) Research and development efforts will provide new and improved agricultural and forestry management practices and systems that will increase farmer, rancher and forester effectiveness in reducing the chances of water quality degradation for a wide range of conditions. Research is essential to expand and improve our understanding of the mechanisms that govern the movement of agrichemicals through soil and geologic materials and that govern how such chemicals become

available in forms that readily move through these media into groundwater. This new knowledge about the fate and transport processes of agrichemicals will provide the bases for developing new and improved practices and systems to control agricultural nonpoint sources of actual or potential water contamination. Analyses of socio-economic effects and impacts of current and new management methods on farm, community and regional bases will provide measures of the relative cost-effectiveness of alternative practices and systems.

(3) Development of comprehensive, consistent, periodic national data on agricultural chemical use, related farm practices, and links with the physical environment will provide the necessary basis for Federal agencies and State governments to assess the implications of current agricultural practices and to evaluate the consequences of alternative policies for reducing any adverse effects of agricultural production on water quality. Centralized systems for linking data and statistical information on agricultural productivity, land use, agricultural chemical use, physical attributes of the land and surrounding watersheds, climate, and water quality will support a variety of program decisions by a range of Federal and State agencies, including those requiring improved pesticide benefit assessment.

Planned Output and Program Support Activities. The foregoing functional components will be implemented through 10 major output-oriented and program support activities:

- Building National and State databases on agrichemical use and related farm practices
- Providing digitized geographic information systems for State and Federal evaluation of alternative policies and program strategies
- Developing methods for sampling, measuring, and evaluating groundwater contamination
- Conducting fundamental research to provide the basis for improved management of chemicals used in agriculture
- Improving agrichemical management and agricultural production systems
- Expanding USDA and CES staff capacity to deliver educational and technical assistance to producers for effective agrichemical and waste product management and environmental stewardship
- Demonstrating and delivering technologies and management systems for voluntary farmer, rancher and forester adoption and implementation
- Meeting State water quality requirements through education and technical assistance
- Evaluating economic, social and technical effects and impacts of new and improved management practices and systems
- Informing the public of program activities and achievements

These building blocks constitute a fully integrated system within which each set of outputs relies upon successful achievement of related program components to assure the Nation's producers are provided with profitable options for effective agricultural chemical management.

Interagency Coordination and Relation to Ongoing Programs

The planned activities of 8 principal USDA Agencies and the State Agricultural Experiment Stations and Cooperative Extension Services are closely coordinated with each other and with related activities of EPA and Agencies of the Departments of Interior and Commerce under the President's Water Quality Initiative. The USDA Water Quality Program will benefit from related, past and ongoing Departmental efforts in soil and water conservation, public information, research, and extension, and will complement the aims of other targeted programs such as Integrated Pest Management (IPM), Low Input Sustainable Agriculture (LISA) and the National Agricultural Pesticide Impact Assessment Program (NAPIAP).

WATER QUALITY PROGRAM PLAN
TO SUPPORT THE PRESIDENT'S WATER QUALITY INITIATIVE
USDA AND COOPERATING INSTITUTIONS

The President's Water Quality Initiative

USDA's contribution to the President's Water Quality Initiative brings a new focus and coordinated commitment to the goal of protecting the Nation's water from contamination by agricultural chemicals and waste products applied on agricultural lands.

President Bush recommended a new initiative for enhancing water quality in his 1990 budget proposal to the Congress, presented on February 9, 1989. The President's initiative defines a vigorous effort to protect ground and surface water from potential contamination by agricultural chemicals and wastes, especially pesticides and nutrients. The initiative integrates the combined expertise of Agencies from four Federal departments to promote the use of environmentally and economically sound farm production practices, and to develop improved chemical and biological pest controls.

The initiative, in its first principle emphasizes groundwater protection. Other principles and policies speak to agricultural nonpoint sources of water pollution in general. To support the initiative, the President proposed a $41.2 million permanent increase to the current USDA $140 million base funds which are now devoted to ongoing water quality programs and activities. The Department and cooperating State institutions understand that the main emphasis for the budget increase is on reducing ground water contamination by agricultural chemicals. Current programs addressing degradation of water quality as a result of agricultural practices are to continue.

In his statement of principles and policies, the President makes it clear that farmers are ultimately responsible for avoiding contamination of water resulting from management practices they apply to the landscape. He also stated that the role of USDA is to conduct research and provide education and technical assistance that helps producers fulfill their responsibilities by developing and demonstrating "...farming practices that avoid water quality degradation...," and that are economically viable.

The USDA, the cooperating State Agricultural Experiment Stations (SAES) and State Cooperative Extension Services (CES) are prepared to accept the responsibilities for their part in the President's initiative. A multi-Agency, multidisciplinary plan has been developed to meet the challenge head on. The planned program will clearly demonstrate that agriculture is concerned about the environment and that the agricultural sector can and will make the necessary changes to protect ground water quality. The plan also provides for input from and cooperation with other Federal and State departments.

PRIMARY GOALS AND OBJECTIVES OF THE USDA'S AND STATES' CONTRIBUTION TO THE PRESIDENT'S WATER QUALITY INITIATIVE

The primary goal of USDA's Water Quality Program is to:

Provide farmers, ranchers, and foresters the knowledge and technical means to respond independently and voluntarily in addressing on-farm environmental concerns and related State water quality requirements. The Department plans to achieve this goal in a way that reduces the need for restrictive regulation, and in a manner that maintains agricultural productivity, avoids economic hardship, and sustains an economical and safe supply of food and fiber.

The primary objectives of the multi-Agency, multidisciplinary plan for this program are to:

- *Determine the precise nature of the relationship between agricultural activities and ground water quality.*
- *Develop and induce the adoption of technically and economically effective agrichemical management and agricultural production strategies to protect water quality.*

Overview of USDA Water Quality Program Plan

Program Plan Involves Substantively New and Different Directions for USDA

The management of agricultural chemicals and wastes to meet environmental and public safety objectives is in many ways a new functional activity for USDA, particularly as it relates to groundwater contamination. It involves the capabilities and activities of more USDA Agencies, working in closer concert with a wider variety of Federal and State Agencies than any previously established Departmental function. It is a unique approach to solving a very complex issue.

The USDA water quality program is supplemental to existing programs. Its distinction arises from (1) its particular focus on agricultural chemicals and groundwater contamination, and (2) the extensive degree of interagency coordination, collaboration and program integration required to successfully achieve its goals. It builds upon a proud USDA history of accomplishment, expertise, and experience in basic and applied agricultural research, soil and water conservation, and a variety of farmer education and extension programs for the development and use of best management practices to protect soil and water sources in rural areas. Activities carried out under the President's Water Quality Initiative are expected to benefit from, as well as contribute to, ongoing programs.

The integrated development of basic data, the underlying science and technology, and the operational information and practices for implementation of effective agricultural chemical management systems will be accomplished through cooperative and collaborative Agency activities following the objectives and guidance of the Departmental Plan. No overall lead Agency will be designated.

USDA technical assistance programs relating to water quality have historically focused on reducing sediment and sediment-borne contaminants in surface waters as well as animal waste management and salinity control. The Department, SAES and CES biological pest control, integrated pest management, and nutrient management research and programs need to be linked with compatible efforts to understand and address groundwater contamination. Although the USDA, SAES and CES have the basic capabilities to address agricultural chemical and groundwater issues, the required data and information bases, and the coordinated delivery systems have not been developed and implemented for effective agricultural chemical management systems. The USDA response to the President's Water Quality Initiative rectifies these problems.

A total of 8 principal USDA Agencies and their cooperating State institutions and Agencies are collaborating with the Environmental Protection Agency (EPA), the United States Geological Survey (USGS), and the National Oceanic and Atmospheric Administration (NOAA) to produce a wide range of new and interrelated water quality program outputs.

The USDA's Water Quality Program plan is described in the following pages. The plan is built upon the foundation of successful, historical programs. It is designed to complement established targeted programs, such as Integrated Pest Management (IPM), and the National Agricultural Pesticide Impact Program (NAPIAP), and newer programs such as Low Input Sustainable Agriculture (LISA). Its successful implementation is expected to increase significantly the contributions of the established USDA base program to water quality and contribute importantly to a growing compatibility between agricultural production and environmental quality.

Principal USDA and Cooperating State Program Agencies Contributing to The Initiative

- Agricultural Research Service (**ARS**)
- Agricultural Stabilization and Conservation Service (**ASCS**)
- Cooperative State Research Service (**CSRS**) in conjunction with the system of State Agricultural Experiment Stations (**SAES**)
- Economic Research Service (**ERS**)
- Federal Extension Service (**ES**), in conjunction with State and County Cooperative Extension Services (**CES**)
- Forest Service (**FS**)
- National Agricultural Statistics Service (**NASS**)
- Soil Conservation Service (**SCS**)

Each lead Agency has a number of new, multi-Agency, multidisciplinary program activities, many of which are also coordinated with ongoing or refocused programs of other USDA Agencies, including the: Animal and Plant Health Inspection Service (**APHIS**); Farmers Home Administration (**FmHA**); and National Agricultural Library (**NAL**).

Overview of USDA Water Quality Program Plan

Integrated Water Quality Program Plan is Output-Oriented

The USDA Water Quality Program will produce a closely-linked array of outputs and support activities: National and State data on agrichemical use; related information on soils and farm practices; new research knowledge on the fate and transport of agrichemicals; new and improved agrichemical management and agricultural production practices and systems; educational and technical assistance to farmers, ranchers and foresters as well as States and communities; evaluations of impacts and effects of new and improved practices and systems, and public information materials on the activities and accomplishments of the program. The successful integration and achievement of these interdependent program components will provide a new basis for the nationwide expression of the Department's commitment for mutual retention of National agricultural productivity and environmental quality. The Nation's producers will be provided means for cost-effective agricultural chemical and waste management and environmental stewardship, particularly for water quality.

The USDA Water Quality Program plan recognizes that some appropriate technology is currently available to improve agricultural chemical management. But, much remains unknown about the magnitude and extent of agriculture's effects on water quality, the specific nature of agricultural chemical fate and transport in water systems, and the economic and environmental tradeoffs among alternative production and agricultural chemical management systems. Thus, educational and technical assistance, research, and database development and evaluation, the three major functional components of the USDA Water Quality Program, will get underway concurrently. They will address ten output-oriented and program support building blocks which constitute the implementation strategy for the USDA Program. The program building blocks define "what needs to be done" to help producers use agricultural chemical and waste management technology, practices and systems that will contribute to the maintenance of agricultural productivity while protecting ground and surface water quality.

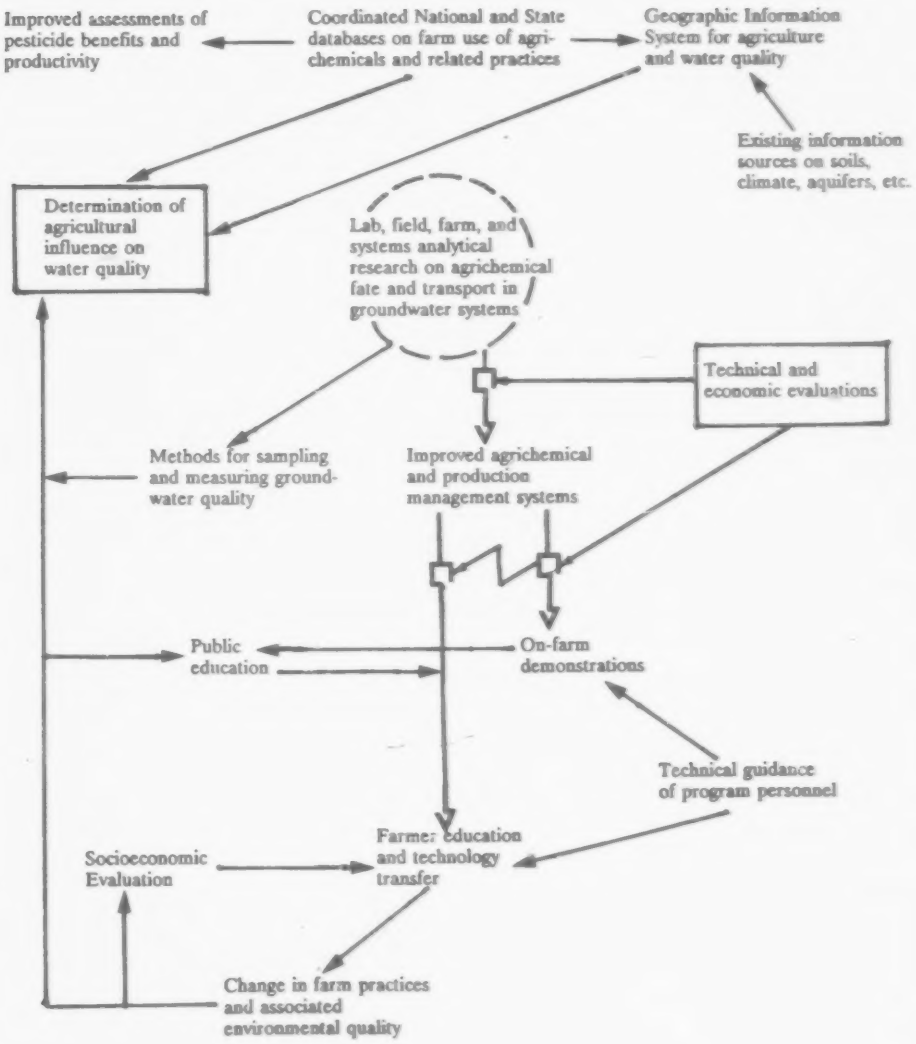
New and expanded **National and State databases on agricultural chemical use and related practices**, and the development of coordinated, digitized **geographical information systems** will provide the basis for producing improved pesticide assessments, evaluating agriculture's impact on the environment, selecting critical areas for targeting research, education, technical and financial assistance, monitoring change over time, and documenting improvements in productivity and environmental quality.

New fundamental and applied research activities will improve **methods for sampling, measuring, evaluating groundwater contamination problems**, and expand our knowledge and understanding of water contaminant sources, degradation processes and products, and chemical movement through soils. Critical longer-term research will be planned and conducted to better understand the persistence of contaminants where it occurs, or its absence. This research will produce **new technologies** and **improved agricultural and forestry management systems** that reduce the chances of water degradation.

A series of **on-farm demonstration projects** and other targeted **farmer education and technical assistance** efforts will speed the delivery of technologies and management systems to farmers. These efforts will initially focus on improving the transfer of available information and technology and to incorporate new findings, advanced technologies, and improved management systems as they emerge from the program's research efforts. **Economic and social evaluations** will assure that the management systems developed and extended are both practicable and profitable. Widely disseminated **public information** will facilitate community-wide understanding and acceptance of the need for increased compatibility between agriculture and the environment.

A schematic design of the linkages among the 10 output-oriented and program support building block components of the USDA water quality strategy is presented in Figure 1. Their objectives, procedures, intended beneficiaries, leadership roles, coordination and integration mechanisms, and delivery schedules are described on the following pages.

Figure 1. Schematic design of linkages among the output-oriented and program support components of the USDA Water Quality Strategy.


Improved assessments of pesticide benefits and productivity
Coordinated National and State databases on farm use of agri-chemicals and related practices
Geographic Information System for agriculture and water quality
Existing information sources on soils, climate, aquifers, etc.
Determination of agricultural influence on water quality
Lab, field, farm, and systems analytical research on agrichemical fate and transport in groundwater systems
Technical and economic evaluations
Methods for sampling and measuring ground-water quality
Improved agrichemical and production management systems
Public education
On-farm demonstrations
Technical guidance of program personnel
Socioeconomic Evaluation
Farmer education and technology transfer
Change in farm practices and associated environmental quality

Planned Outputs and Program Support Activities

Building Nationally Coordinated Databases on Agricultural Chemical Use and Related Farm Practices

The development of comprehensive, consistent, periodic National data on agricultural chemical use, related farm practices, and links with the physical environment will provide the necessary basis for Federal Agencies and State Governments to assess the benefits, costs and other effects of current agricultural practices and to evaluate the consequences of alternative policies and practices for reducing any adverse effects of agricultural production on water quality.

Objectives: Develop, analyze, and disseminate timely, statistically reliable and detailed data on farm use of pesticides, fertilizers, and related inputs.

Procedures: A continuous cycle of commodity-specific, National surveys will be established and implemented to create cross-sectional and time-series data on farm use of agricultural chemicals and waste products. Survey instruments will be designed to concurrently collect data on related farm practices and the physical attributes of the land, in cooperation with SAES and CES, and in sufficient detail to satisfy local requirements consistent with available funding. Farm survey efforts will be initiated through a pilot test on a single crop in early 1990, and will proceed to cover all major and a range of minor commodities over a 3-4 year period before the cycle repeats. Resultant data will, at a minimum, be statistically significant at the State level. States and other Government Agencies will be given the opportunity to supplement survey funds for additional sub-State sampling to provide more site- and field-specific, locally relevant data. Summarized survey results will be widely disseminated via print and electronic media.

Beneficiaries: With regard to the USDA Water Quality Program, the data will: (1) provide one basis for identifying priority areas for research, education, technical and financial assistance efforts; (2) form a component of the geographic information system; and (3) support efforts to assess the benefits and costs of new agricultural chemical management strategies.

Improved agricultural chemical use data will: (1) substantially enhance EPA and USDA pesticide benefit-risk assessment activities under the National Agricultural Pesticide Impact Assessment Program (NAPIAP); (2) assist in targeting programs of the Food and Drug Administration and other food safety services; and (3) provide State Agencies which undertake additional sub-State sampling more intensive locally relevant data and a cost-effective means to assess the relationship between actual agricultural practices and State water quality requirements.

Leadership and Coordination: ERS and NASS will design the National surveys with input solicited informally from the other USDA Agencies and SAES, and from EPA and USGS. NASS will conduct the enumeration through a reimbursable agreement with ERS. ERS will summarize and disseminate the data and any related analytical or interpretive reports. SAES will develop more site-specific farm- and soil-specific databases.

Planned Schedule for Building a Nationally Coordinated Database on Agricultural Chemical Use and Related Farm Practices

			NAPIAP Applications and Benefits
1990	Plan survey cycle for collection of use data by major and minor crops, and livestock categories. Select on crop for pilot test of survey. Develop preliminary survey questionnaire and solicit input and participation in questionnaire design from other Agencies. Conduct the pilot test.	Invite, solicit, and assess opportunities to enhance sampling activities at sub-State level.	Determine baseline for the independent, historical contribution of pesticides and of nitrogen fertilizers to growth in agricultural productivity.
1991	Summarize, interpret and disseminate findings from 1990 survey. Develop and pretest questionnaires for remaining major field crops, livestock, fruit and vegetable crops. Determine feasibility of expanding sample size in Midwest States that prove unable to supplement survey efforts to achieve sub-State reliability.	Initiate planned survey cycle by holding enumerator training and conducting 3 crop-specific surveys.	Estimate the cumulative effect of past pesticide regulation on the agricultural sector and rural communities through 1990.
1992	Summarize, interpret and disseminate findings from 1991 surveys. 1991 surveys.	Conduct 3-5 commodity-specific surveys as per planned survey cycle.	Continue to increase and enhance USDA capabilities to perform pesticide benefit assessments at the rate and of the form required for EPA benefit-risk determinations.**
1993 and beyond	Continue to develop and implement surveys and summarize, interpret, and disseminate survey findings according to originally planned survey cycle, as expanded over time to accommodate emerging needs.		

**In all years, through ongoing NAPIAP programs, generate data through expert opinion to fill survey gaps on the use of agricultural pesticides undergoing special review by EPA, and conduct pesticide benefit assessments by selected commodity and for large classes of pesticides. Utilize accumulating, National pesticide use data (collected via USDA surveys) to regularly update estimates of pesticide regulatory effects on the magnitude and distribution of farm input industries, rural communities, and water quality.

Planned Outputs and Program Support Activities

Developing a U.S. Geographic Information System (GIS) for Agriculture and Water Quality

The development of a digitized geographic information system for agriculture and water quality will link nationwide data and statistical information on agricultural productivity, land use, agrichemical use, physical attributes of the land and surrounding watersheds, climate, and water quality, to support a variety of policy and program decisions by a range of Federal and State Agencies.

Objectives: Determine on a national basis, the locations and relative intensities of potential water quality problems which are independently indicated by concomitant geographic occurrence of specific geomophologic systems, soil types, geologic sequences, vulnerable water systems, land uses, agricultural practices, farm types, and weather systems.

Many Federal Agencies have planned or ongoing activities to compile and distribute descriptive national data sets. A few relevant examples include: the collection of data on soil properties through the SCS and national Cooperative Soil Survey program; NOAA's extensive records of weather and climate data; EPA's national well water survey; USGS compilation of the characteristics of the nation's hydrologic systems; ASCS farm and program participation records; APHIS collects data through its cooperative plant and animal health monitoring system; and ERS and NASS national surveys on agricultural land use, agricultural practices, and farm costs and returns. The value of these independently detailed databases could be enormously enhanced by merging them to discover the interrelationships among various physical, agronomic, and economic characteristics and by improved accessibility to these data and information by all interests.

Procedures: Because the various data sets originate from different sampling procedures, are stored in different forms, and are statistically reliable at different levels of geographic specificity, simple mapped overlays of current information are neither possible nor valid without extensive data reconciliation. Thus, initial steps for the development of a comprehensive GIS involve putting the various component data in compatible format and conducting statistical procedures to determine the nature of statistically reliable geographic overlaps among the disparate databases. Data not already georeferenced in digital format will be digitized and a computer-aided stratification for survey sampling will be developed to reconcile data sources. As the various data become available in newly consistent and compatible forms, they will be merged to create a GIS which combines data on agricultural activities with data on climatic, hydrologic, and other physical attributes.

Beneficiaries: The nationwide GIS on agriculture and water quality will be accessible to any Agency with research or program goals that can be enhanced by this comprehensive digitized data system. The availability of the GIS will form a tangible basis for increasing interagency cooperation and increased consistency among Government programs.

Knowledge of the geographic relationships between potentially problematic conditions and practices will directly contribute to the selection of sites and future focus of ground water research, education, demonstration, and technical assistance efforts under the USDA Water Quality Program. Benefits should accrue to a wide range of other, unrelated programs of all participating Federal Agencies and to State and local program Agencies as well as the private sector.

Leadership and Coordination: NASS, in close cooperation with SCS and CSRS-SAES, and with input from a wide range of Federal and State Agencies, will lead the effort to build, make operational, and maintain the GIS. The agricultural chemical use data to be collected under USDA's Water Quality Program will be an important component of the GIS. Within the Department, activities will be coordinated through the existing USDA Geographic Information Systems Subcommittee of the Natural Resources and Environment Committee. Especially heavy collaboration between USDA and USGS is anticipated.

SEQUENCE OF ACTIVITIES REQUIRED TO DESIGN AND CONSTRUCT A COMPREHENSIVE U.S. GEOGRAPHIC WATER QUALITY INFORMATION SYSTEM FOR AGRICULTURE

1990: Conduct research on geographic information system (GIS) methodology (**NASS; SAES**)

Digitize soils interpretation and NRI data (**SCS**).

Incorporate USGS digital data into USDA sampling procedures (**NASS**).

1991 to 1992: Develop statistical procedures to use high resolution satellite imagery in locating cultivated land in geographic proximity to surface water (**NASS; NOAA**).

Construct cartographic overlays of currently available digitized geographic data on soil and water systems (**SCS; USGS**).

Determine how to optimally integrate imagery, digital topographic, ground and farm-level, field-level, and other survey data to maintain statistical integrity (above and beyond cartographic integration) -- (**NASS**).

Develop procedures to automatically classify and identify physical and biological barriers to ground and surface water contamination, for use in GIS database (**SCS; ARS; USGS; EPA, NASS, CSRS/SAES**).

1993 to 1994: Develop data structures and computer processes for GIS construction (**NASS, SCS**).

Provide data, in appropriate form for GIS integration on: soils and National Resources Inventory (NRI) (**SCS**); farm and conservation program participation (**ASCS, SCS**); cropping patterns (**NASS**); agricultural input use (**ERS**); weather patterns (**NOAA**); hydrology, geology, and topography (**USGS**); and water quality monitoring and test results (**EPA**).

Merge reconciled data to form a U.S. Geographic Water Information System for Agriculture (NASS and SCS, with input from Agencies indicated above).

Apply GIS databases to describe coincidence of agronomic, physical and economic phenomena to water quality problems.

Planned Outputs and Program Support Activities

Developing Improved Methods for Sampling, Measuring and Evaluating Groundwater Contamination Problems

General and site-specific research on agricultural chemicals in groundwater requires early development of new, rapid and lower cost field and lab techniques for sampling and measuring contaminants and identifying their sources and flow paths. Development and application of such tools are thus among the initial priorities of research efforts.

Objectives: Assess the extent to which agricultural practices contribute to contamination of ground water. Develop improved procedures to measure and evaluate the physical, chemical, and microbial processes involved in the movement of chemicals through the soil and into ground water.

Procedures: Research will be conducted to develop and improve laboratory and field methods for rapidly, reliably, and cost-effectively sampling and analyzing pesticide residues and other contaminants and for determining the rates at which water and chemicals move through soil to groundwater, and for interpretation of analytical results. Initially, research will give priority to developing improved sampling and analytical methodologies. Improved sampling methodologies will provide the means to obtain accurate and representative data at a reduced cost, including in situ pesticide analytical methods, leachate and groundwater recharge measurement and sampling methods, and sampling strategies and protocols that accurately determine spatial and temporal variabilities. Also, it will be necessary to develop improved methods for agricultural chemical handling and disposal so that subsequent research on agricultural chemicals in groundwater can isolate the effects of point from nonpoint sources of potential contamination.

Beneficiaries: Virtually any Federal, State, or local Agency involved with environmental monitoring will benefit financially and scientifically from the availability of accurate, reliable, and lower cost sampling, measurement, and evaluation tools. Furthermore, the application of these methods within the President's Water Quality Initiative will serve the general public and administrative needs to gauge the nature and extent of agriculture's independent contribution to observed groundwater quality problems.

Improved protocols will lead to greater efficiency in the collection of groundwater quality measurements in conjunction with national, State, and local site-specific surveys on farm use and effects of agricultural chemicals and related practices. Their widespread application will contribute to the value of data represented in geographic information systems. Evaluation of findings from their use will provide the fundamental basis for determining and communicating the current situation and future outlook for agriculture's relationship to water quality.

Leadership and Coordination: USDA research on and development of soil and groundwater sampling, measurement, evaluation, and agricultural chemical disposal and isolation tools will involve the joint efforts of ARS, CSRS and SAES, and FS. Research will be coordinated with USGS and EPA efforts, and will be designed to develop sampling, analytical, and statistical methodologies for surface and groundwater quality. NASS, ARS, and SAES will determine the feasibility of conjunctive collection of groundwater quality and farm practice data from farmers. ARS and SAES will reconcile groundwater quality data with statistical information on management practices and the physical attributes of the land.

PLANNED ACTIVITIES AND OUTPUTS FOR SAMPLING, MEASURING AND EVALUATING GROUNDWATER CONTAMINATION PROBLEMS

1990	On-farm techniques for inexpensive, rapid cleaning/disposal of pesticide containers made available.	
1991	Improved field and lab techniques for evaluation of water quality (e.g., rapid, lower cost detection and vadose zone sampling) released.	Improved sampling and measurement methods installed on system research sites.
1992	Release improved on-farm pesticide cleanup techniques.	Incorporate water quality sampling into agrichemical use survey efforts.
1993 and later years	Release new and modified methods for data acquisition.	

Planned Outputs and Program Support Activities

Conducting Fundamental Research to Provide New Technology and Knowledge for Improved Management of Chemicals Used in Agriculture

Development of improved management of agricultural production systems that prevent contamination of groundwater is highly dependent upon understanding mechanisms that govern the persistence and movement of agricultural chemicals through soil and geologic materials, and that govern how such chemicals become available in forms that readily move.

Objectives: Identify and understand the biological-physical-chemical processes that determine how agricultural chemicals change or persist in the soil and how they and their breakdown products move downward to enter groundwater. This research is the core of understanding the principles involved in chemical degradation, reactions, and persistence in soils and water.

Procedures: Basic studies will be made to document the sources and amounts of potentially hazardous contaminants in groundwater attributable to agricultural and forestry practices, and to identify and determine the significance of the basic processes involved in their movement through soil into groundwater. Results of these individual studies will be assembled into integrated subsystems and process models.

Laboratory and field studies will be conducted at sites throughout the Nation to fill the knowledge gap that currently exists in understanding the fate of chemicals from pesticides, fertilizers, and wastes, and the linkages between agricultural chemical application to land and the occurrence of residues in groundwater. Knowledge of individual processes and integrated subsystems is absolutely essential so teams of scientists can develop new agricultural management systems that reduce or prevent leaching of chemicals from farm fields to underlying groundwater.

Beneficiaries: Ultimately, this work is critical to understanding processes in soils and the maintenance of an environmentally acceptable groundwater quality. All segments of society will benefit. Scientists, extension, education and technical advisors will receive more accurate information for use in developing new materials to assist the Nation's producers in improving their effectiveness in both agrichemical management and environmental stewardship. Agricultural producers will receive immediate benefits in the form of well-founded management systems with which to carry out their responsibilities to themselves, their families and to society.

Leadership and Coordination: USDA research will be led through the joint efforts of ARS, CSRS, SAES, and FS and coordinated with USGS groundwater quality research and with the needs of SCS, FS, and EPA.

21-704 - 89 - 4

Planned Schedule for Fundamental Research Activities to Determine and Understand Mechanisms that Govern the Persistence and Movement of Agrichemicals through Soils and Geologic Materials

1990	Initiate fundamental research on priority water quality problems through the grant process
	Water quality measurement and sampling instrument installation started on field and farm sites
	Models to evaluate management systems for their effects on groundwater quality
1991	Continue fundamental investigations and initiate additional components of research on prioritized objectives
	Monitor water quality in relation to agronomic practices and physical attributes of land
1992	Begin release of individual systems component studies (e.g., sorption of pesticides on soil complex; occurrence and importance of preferential flow paths). Continue basic studies, as needed and initiate new studies on basic problems and identified gaps in models
1993 to 1994	Release refined models for assessing agricultural effects on groundwater quality Continue basic studies as needed

Planned Output and Program Support Activities

Improved Agricultural Chemical and Production Management Systems

The ultimate goal of systems analytical and site-specific research activities is the knowledge-based development of new, practical and profitable management systems that reduce environmental loading of contaminants from agrichemicals and waste products while maintaining agricultural productivity and water quality.

Objectives: Improve existing and develop new, cost-effective agricultural systems to address water quality problems.

Procedures: A major effort will be devoted to applying the systems approach to develop specific options to address effects of agriculture on water quality. These systems will include alternatives for managing soils, crops, chemicals, and water to maintain farm profitability and enhance soil and water quality. Systems will also be adopted for field use and tested for safe and environmentally sound storage and handling of pesticides.

Systems developed will be approached on a crop and regional basis. One such program is the Midwest Initiative which will focus on the development of cost-effective and environmentally safe corn and soybean production systems. Other managements systems are being evaluated concurrently in several other areas of the country, both in on-going programs and through grants.

Research sites in the Midwest will be chosen in representative production areas overlying significant aquifers. Researchers will measure key inputs and outputs of water and chemicals on each site to determine rates and amounts of chemical loss to water and will collect data on economic costs and returns.

Development of system simulation models is well underway at several State and USDA locations across the country. Completion of this on-going research and the use of the resulting models will allow tentative or trial release of practice recommendations and selection of promising management systems for field testing and verification in a relatively short time in the Midwest Initiative. In addition, development of expert systems or other decision aids that incorporate current best knowledge regarding agricultural chemicals management should be released for use during the second year of the Initiative. Related research in on-going programs, new grants from the new Water Quality Initiative and the Midwest Initiative will be coordinated into an integrated overall water quality program.

Evaluation of new management systems for corn and soybean production at targeted sites in the Midwest will require a start-up period of up to 2 years. Preliminary evaluation of some systems may be possible after 3 years in the absence of drought or other weather-related problems. However, depending on the length of crop rotations, time for chemical treatments to be expressed in groundwater, and considering weather vagaries, 12 to 15 years may be required to fully evaluate the effectiveness of the systems in preventing groundwater contamination. After field installations, sample analysis and initial model development are completed at Midwest sites, it should be possible to shift funds to further increase research on serious fundamental knowledge gaps, to broaden coverage of Midwest problems, and/or extend research to other areas of the country.

Beneficiaries: The products of research on agricultural chemical and production management systems will feed directly into the USDA Water Quality Program's education and technical assistance efforts, whose principal beneficiaries are the farmers, ranchers, and foresters to whom cost-effective management systems for ground water protection are extended. As with most research efforts of this magnitude, useful technological spin-offs will likely arise.

Leadership and Coordination: ARS, CSRS, and State cooperators at the Land Grant universities have the lead roles in USDA's water quality research plan. They will ensure that new water quality research projects are coordinated with existing and related projects and that new research is sharply focused on filling the gaps in information and technology for assessing and managing ground water quality. ERS and NASS will coordinate with ARS, CSRS, and State cooperators to assure uniform parameters, definitions and measures of farm costs, returns, and productivity are used in the analysis of economic and social consequences of alternative management practices and systems and agricultural policies.

The Midwest Initiative will be conducted in cooperation with the Midcontinent Initiative of the U.S. Geological Survey. USDA and USGS have appointed representatives to each other's planning committees.

PLANNED OUTPUTS AND PROGRAM SUPPORT ACTIVITIES FOR IMPROVED AGRICULTURAL CHEMICAL AND PRODUCTION MANAGEMENT SYSTEMS

1990	Field sites for determining impact of alternative management practices upon agricultural chemical losses to ground water selected and characterized.		
1991	Measurement and sampling instrument installation on field sites Demographic, economic information collected in study areas; baseline studies completed.	New alternative management systems for alleviating groundwater problems such as use of new tillage or pest management practices based on off-shelf knowledge and on-going research.	
1992	Production management research evaluation site installation completed.	Costs and benefits of alternative management systems for "whole farms," and estimated impacts on farm costs, returns and productivity.	Release preliminary assessment of accumulative effects of management activities in time and space for mixed use (timber and cropland) areas.*
1993	Improved models and management systems, and producer decision aids for their implementation.	Second year soil, chemical and crop management site effects allow drawing first tentative conclusions on water quality impacts from modified management systems that are single-cropped (no rotation).	First tentative conclusions based on 3-year results of studies on mixed land-use study.
1994	Redirect part of USDA support from Midwest Initiative to other areas.	Analysis of socioeconomic consequences of second round of modified management practices and agricultural policies directed toward protecting groundwater.	

*Dependent on funds being made available to the Forest Service for this purpose in FY 1991.

Planned Outputs and Program Support Activities

Expanding USDA and CES Staff Capacity to Deliver Educational and Technical Assistance to Producers for Effective Agrichemical and Waste Product Management and Environmental Stewardship

USDA and CES staff capacity for the planning, delivery, and analysis of water quality protection procedures and improved agricultural chemical and production management systems will be expanded and enhanced through updating the Soil Conservation Service Field Office Technical Guides, other references, and through organized professional training.

Objective: Provide USDA and CES field office personnel the detailed technical knowledge and ability to accomplish the farmer education and technology transfer goals of the water quality program in every agricultural county in America.

USDA and CES educational, technical, and program personnel are located in each U.S. State and every agricultural county in America to assist farmers, educate the public, and carry out other program priorities which, at present, involve limited focus on ground water quality related to agricultural chemical use. Much of the achievement of the USDA Water Quality Program's farmer education and technology delivery goals will depend squarely upon these field-based representatives. Detailed field guides and organized professional training on new concepts and technologies pertaining to agricultural chemical and waste product management and related environmental stewardship are essential to develop that delivery capacity.

Procedures: A significant component of the technical support capabilities activity will be the education and training of field office personnel to deliver expanded programs, develop or refine water quality practice standards and specifications, implement Geographic Information Systems (GIS) technologies, and conduct monitoring and evaluation, including the analysis of results and the refinement of technical procedures. SCS and ES will publish information material to provide technical guidance on the environmentally responsible management of pesticides, nutrients and waste products for use by farmers, foresters, farm advisors, agribusinesses, and local, county, and State Agencies.

Workshops and special training sessions will be held for USDA and State Agency personnel. A prerequisite to this training will be the selective expansion of ES and SCS technical staffs to ensure that an adequate level of professional support is available.

Beneficiaries: Farmers, ranchers and foresters will directly benefit from access to an expanded cadre of thoroughly and well trained Federal and State Agency personnel who possess state-of-the-art knowledge on agricultural chemical and production management strategies to meet environmental stewardship objectives for protecting water quality.

Leadership and Coordination: Technical Guide preparation and professional training will largely be conducted by and for ES, CES, SCS and FS personnel, who will call upon the expertise of other lead USDA Agencies, EPA, and USGS as technical resources, trainers, and reviewers of draft technical materials. State Agency personnel and field representatives of other Federal Agencies, such as ASCS, will be invited to participate both as trainers and trainees, as appropriate.

PLANNED ACCOMPLISHMENTS TO IMPROVE USDA AND CES TECHNICAL SUPPORT CAPABILITIES

	Technical training	Water quality field staff expansion	Technical materials
1990	Totals of 4,000 Federal [1/] and 2,500 State Agency [2/] personnel trained.	A total of 40 new technical specialists hired.	Technical materials representing current state of knowledge on agrichemical management and the effects of conservation practices on groundwater and surface water will be developed for an estimated 2,600 field offices.
1991	A total of 8,000 Federal and 5,500-6,000 State Agency personnel trained.	Between 20-30 new technical specialists hired.	Technical materials prepared for an additional 600 field offices. Former materials updated to incorporate new findings from research efforts.
1992	A total of 3,000 Federal and 1,000-2,000 State Agency personnel trained.	Between 15-25 new technical specialists hired.	Outdated training and technical materials replaced with new guidelines on advanced management strategies arising from research and development efforts.
1993 and beyond	Technical guides continuously revised and updated to rapidly reflect new knowledge, understanding, and management of agricultural chemicals, waste products, and water resources.		

1/ Federal includes ASCS, SCS, and CES (State level)

2/ State agency includes county extension agents, conservation district staff, State and local agency personnel and others.

Planned Outputs and Program Support Activities

Demonstration Projects

Large scale demonstrations and application of currently available and new technology involving many commercial farming operations in large, contiguous land areas will demonstrate to producers, the public and environmental interests that State requirements for ground and surface water quality can be met effectively and voluntarily. Site-specific on-farm demonstrations of improved practices to reduce the transport of agrichemicals through soils and potentially to groundwater will be established to accelerate producer adoption and implementation.

Objective: Encourage accelerated adoption of appropriate technology by producers, as a means of achieving voluntary, cost-effective, and substantial reduction in the loadings of agricultural chemicals to the environment where there is evidence of a water quality problem relating to agriculture. Demonstrate for the soils, climate, cropping and farming practices in each project area how quickly and effectively producers can modify their pesticide and nutrient inputs, conservation systems, tillage and management practices to reduce the movement of agrichemicals and waste products through soils and potentially to groundwater and surface water.

Procedures: Projects will be located in multi-county areas to address nonpoint source water quality impairment under specific agricultural, soils, and geologic conditions; and where the water resource has high economic and environmental value. For these projects, critical nonpoint sources of contamination will be identified and specific treatment goals established. Utilizing the best available research data, cost effective resource management systems that integrate efficient production practices with agricultural chemical management will be designed for each demonstration area. Projects will demonstrate to commercial farmers, ranchers and foresters, on their own and their neighbors' lands, pesticide and nutrient management systems that minimize ground and surface water loadings of agricultural chemicals and wastes. Economic, social, and environmental barriers to adoption of these systems will be identified and cost effective solutions to overcome these barriers will be demonstrated. Some financial assistance will be available under the Department's Agricultural Conservation Program. Projects will be evaluated on the extent that improved practices are adopted by producers in each area, the costs of implementation, and the environmental improvements obtained as modified production systems are implemented. Results will be adapted for regional use after 3 years.

Beneficiaries: Farmers and private foresters are the direct beneficiaries of extended knowledge and technology that will allow them to reduce voluntarily the adverse impact of their activities on water quality without incurring economic hardship. Producers, the public and environmental interests will be informed about the agricultural and environmental effectiveness of the projects and the voluntary producer implementation of improved practices. Successful producer adoption of environmentally beneficial practices will also reduce pressure on State and Federal budgets by reducing the need for costly regulatory and enforcement programs.

Leadership and Coordination: The Extension Service and the Soil Conservation Service will provide joint leadership for the implementation of on-farm demonstration projects. The Agricultural Stabilization and Conservation Service will provide financial assistance. The Forest Service has plans to initiate similar projects for forestry management beginning in 1991. APHIS will like results from the projects to its existing and new regional biocontrol and IPM projects. Demonstration project implementation will require coordination among USDA Agencies, and with the Environmental Protection Agency, and Agencies of the Departments of Interior and Commerce. Cooperating State Agencies, conservation districts and other local entities will be involved in planning and implementing projects.

Collaborating Agencies will provide advice on the selection of demonstration sites that will complement technology and management system research and development activities and that will extend the research results to other geographic regions with specific, identified groundwater quality problems.

Planned Sequencing and Practice Adoption for On-Farm Demonstration Projects

1990	Initiate first 8 projects --recruit farmer participants --select initial set of management to be demonstrated --establish specific evaluation criteria --farmer adoption and implementation of practices begins	Select sites for subsequent demonstration projects	
1991	Implement first 8 projects --assist participants in adoption of extended management practices --collect farm level and area-wide data for evaluation purposes --farmer adoption of practices accelerates	Initiate second set of 8 projects	Select sites for subsequent demonstration projects
1992	Evaluate mid-term success of first 8 projects. Adapt and update management plans to incorporate newly developed technologies and management systems. Farmer adoption of practices culminates	Implement second set of 8 projects	Initiate third set of 8 projects
1993	Agencies continue to use on-farm demonstration projects for accelerating improved practice adoption while producers maintain installed practices on the demonstration project farms	Adapt, update, and improve management strategies demonstrated in ongoing projects	
1994	Evaluate the performance and effects resulting from first 8 projects		Continue adapting current projects to take advantage of water quality research findings

Planned Outputs and Program Support Activities

Meeting Water Quality Requirements through Education and Technical Assistance

Education and technology transfer efforts will be targeted to farmers, ranchers, foresters, and rural Agencies who need or seek assistance in implementing management practices that will meet specific State water quality requirements such as those developed for Section 319 water quality plans or specific goals of State, multi-State, regional water quality programs. Where appropriate, specific emphasis will be placed on agricultural nonpoint sources affecting groundwater.

Objective: Provide the background, technology, and consultation support that will allow farmers, ranchers, and foresters to meet formalized State and regional water quality objectives without experiencing economic hardship.

In response to the provisions of Section 319 of the Clean Water Act as amended in 1987, each State is required to submit to EPA a State Nonpoint Source Management Program which indicates the degree to which agriculture is believed to contribute to identified ground and surface water quality problems in the State, and a management plan to reduce identified sources of nonpoint source pollution to the maximum extent possible. Likewise, a number of interstate, interagency efforts, such as the Chesapeake Bay Program and Great Lakes Program, have ongoing initiatives to reduce nonpoint agricultural source contamination of regional watersheds. Agricultural producers who are expected to contribute to State and regional program goals, must be given the knowledge and technology to do so.

Procedures: A major emphasis of this activity is to provide education and technical assistance in hydrologic units identified as significant agricultural contributors to water quality problems by the State Section 319 Assessment Reports. Hydrologic units will be ranked at the State level and selected on the basis of: (1) significance of the agricultural sources of pollution; (2) priority for addressing groundwater problems; (3) relative priority of pollutants (pesticides, animal wastes, nutrients); and (4) integration with other water quality efforts. For each hydrologic unit selected, the nonpoint sources of pollution will be identified and specific treatment alternatives developed. Appropriate existing practices, and improved or new practices as they become available, will be applied to meet the specific water quality improvement needs in the hydrologic unit. Education and technical support will be provided to land owners and local Agencies to assist the implementation of new practices. Experience gained through previous and ongoing water quality programs will serve as one basis for hydrologic unit treatment.

Ongoing educational and technical assistance will be continued for multi-State regional projects which have already established that their most immediate problems are degradation of surface water by nutrients and/or animal wastes. Similar assistance will be extended to new regional projects which qualify. Additional assistance to regional projects will be provided to implement agricultural chemical management plans and the application of water quality education and technology capabilities to support objectives established by the regional management Agencies.

Beneficiaries: By assisting agricultural producers in meeting established State and regional water quality goals and requirements, the beneficial uses of water and its quality will be protected and the need for onerous or costly regulation will be avoided. Thus, benefits accrue directly to farmers, ranchers and foresters in the form of cost-effective alternatives, and to local, State, and Federal Government Agencies in terms of reduced costs, and to the public in terms of agriculture's independent contribution to water quality protection. As a result of USDA assistance and recommendations to the States, it is anticipated that more State and local Governments will adopt SCS standards and guidelines as a basis for their own initiatives to address the use of agricultural chemicals. This should be a factor in promoting consistency among State programs for agrichemical management.

Leadership and Coordination: SCS and ES will jointly lead educational and technical assistance efforts under an existing Memorandum of Understanding Relating to the Implementation of Water Quality Activities. The Forest Service plans to initiate projects relating specifically to ground water quality related to forestry. An interim Memorandum of Agreement establishes the framework for USDA cooperative efforts with EPA. Greater involvement with EPA will include providing technical assistance to support the development of State plans under Section 319 of the Clean Water Act, as amended in 1987 and administered by EPA.

SCHEDULE OF PROJECT DEVELOPMENT AND TARGETED ACCOMPLISHMENTS OF EDUCATION AND TECHNICAL ASSISTANCE TO MEET STATE WATER QUALITY REQUIREMENTS AND GOALS

Project Development Schedule:

	1990	1991	1992	1993	1994
Number of plans and strategies developed and target adoption goals identified for nonpoint source hydrologic units	110	65	55	45	---
Number of nonpoint source hydrologic unit projects initiated	37	73	65	55	45
Number of water quality plans, strategies, and target adoption goals identified for regional water quality programs	95	50	45	40	---
Number of new project areas initiated within existing regional projects	45	50	50	45	40

Targets for Accomplishment of Goals:

	Number of years after a project's initiation				
	1	2	3	4	5
Percent of management plans and practices adopted by producers within hydrologic unit or region	5	20	50	75	100
Data from nonpoint source hydrologic unit projects analyzed	→	→	→	→	Year 5
Data from expansion of regional projects analyzed	→	→	→	Year 4	

Planned Outputs and Program Support Activities

Economic, Social, and Technical Evaluations

Evaluations will be conducted at each stage of management system development, extension, and implementation to assure that new and demonstrated technologies and systems are practical and profitable and maintain productivity, and to design incentive and education programs to assure widespread adoption of effective management systems.

Objectives: Determine the economic and technical feasibility and expected consequences of producer adoption of new technologies and management systems before they are recommended, and follow up to document, refine, and assess actual performance of programs in achieving adoption and water quality goals.

Procedures: USDA will conduct evaluations of the effectiveness of its water quality activities at all levels from individual projects and individual components of projects to the national level.

The overall USDA evaluation will be summarized in an annual report which evaluates the progress of each building block component and the initiative as a whole.

An evaluation requirement will be built into each research plan. Proposals and final research reports will be evaluated to ensure that research results are both technically correct and responsive to practical problems. Cost effectiveness of recommended solutions will be a major consideration.

Evaluation of demonstration, education, technical and financial assistance components will assess whether agricultural chemical and production management systems extended to producers incorporate the best management practices called for in local, State, and regional, and local planning; whether and to what extent these systems are adopted by landowners; whether water quality models and monitoring data indicate that practices are achieving planned water quality goals; and the extent to which management system implementation complements or conflicts with other agricultural, environmental and social goals.

The program's database components will be evaluated through assessment of the timeliness, level of detail, and statistical reliability of the data collected and the usefulness of the data to policy makers, researchers, and action program Agencies.

Beneficiaries: Farmers, ranchers, and foresters, the primary target beneficiaries of the USDA Water Quality Program, will benefit from assurances that their needs and constraints are given attention through economic, social, and technical evaluations. Evaluation reports will guide USDA program administration and inform Federal and State legislators and related program administrators about expected and documented effects of the USDA effort.

Leadership and Coordination: The 8 principal USDA Agencies will participate in coordinated evaluation efforts. ARS and CSRS-SAES will lead technical evaluation efforts. ERS will lead economic and social evaluation activities but rely heavily on collaboration with agricultural economics and social science personnel in SCS, ES, ASCS, FS, and the State Land Grant universities. Annual report preparation will be coordinated by the USDA Water Quality Task Force.

Examples of planned evaluation reports are shown on the facing page.

PLANNED USDA WATER QUALITY PROGRAM EVALUATION REPORTS

Subject of report(s)	Target release date(s) (FY)
Success of 1990 agrichemical use and related practices survey pilot test in meeting USDA, EPA, and USGS data needs	1991
Technical and economic evaluations of newly developed techniques for on-farm pesticide clean-up and disposal (ARS, CSRS-SAES, ERS)	Annually 1991-1995
Use rates and user satisfaction with Water Quality Information Center (NAL)	Annually 1991-1995
Technical evaluations of newly developed field and lab water quality measurement, sampling and analysis techniques (ARS, CSRS-SAES, and user groups)	Annually 1992-1995
Technical evaluation by scientists and users of new management systems models and newly developed alternative management systems (ARS, CSRS-SAES, and user groups)	1992
Economic analysis of input substitution possibilities and economic consequences of alternative management systems designed through initial research efforts (ERS and State Cooperators)	1992
Economic tradeoffs among agricultural productivity, low input agricultural options, environmental regulatory alternatives, the best management approach, and water quality (ERS and State Cooperators)	1992
Interim technical and economic evaluations of additional management options and refinements resulting from 1992 evaluations (ARS, CSRS-SAES, ERS)	1993
Number of extended agrichemical and production management systems adopted, and acres covered by each (SCS, ES)	Annually 1991-1995
Environmental loadings reduced and water quality changes induced by demonstration, education, and technical assistance projects (SCS, ES)	Annually 1991-1995
Evaluation of success of initial demonstration, hydrologic unit, (Section 319) and regional education and technical assistance projects in generating changes in agricultural practices and water quality (SCS, ES, ASCS, ERS)	1993 for 45 regional projects 1994 for 8 demonstration and 37 hydrologic unit projects
Socioeconomic impacts of new and improved management options for improving ground water quality (ERS and State Cooperators)	1994
Overall program evaluation and progress reports (all lead USDA Agencies)	Annually 1991-1995

Planned Output and Program Support Activities

Public Information

Databases, scientific findings, educational materials, progress reports, and general information will be widely disseminated to appropriate audiences to assure that farmers, environmental groups, Federal and State legislators and program administrators, scientists and the general public are aware of agricultural chemical management and water quality program objectives, activities, findings, and accomplishments.

Objectives: Educate the general public on issues of agriculture's relation to environmental quality, share scientific data, and gain community-wide understanding and support of USDA Water Quality Program goals.

Procedures: Frequent press releases will announce and explain the initiation of the program's component projects. Popular publications, written in lay-language, will be prepared and widely disseminated to accelerate public understanding of nonpoint source pollution problems and solutions, including pesticide management, nutrient management, cost-effectiveness of improved management, and testing and treatment of rural water supplies. Annual reports will also be summarized in shortened and easily comprehended format for broad distribution.

A water quality information center will be established at the National Agricultural Library. The center will pilot test a water quality "hotline," expand its Water Information Network, and provide assistance to action Agencies in accessing and analyzing the literature on past research to provide information for technical assistance and educational activities. Databases and survey results summaries will be made widely available via electronic and print media. Workshops and conferences will be held periodically to share scientific findings and present program evaluation results.

Beneficiaries: Overall, the effectiveness of the President's Water Quality Initiative in gaining high standards of water quality protection will be enhanced by public awareness of its various programs, accurate public knowledge concerning the issues, and public support of its goals. Public concerns over groundwater quality will be reduced.

The scientific community, both here and abroad, will benefit from improved access to data and research findings. This easy access should accelerate external research on agricultural and water quality issues by reducing research redundancy and providing a foundation for expanded research on related agroenvironmental issues.

Leadership and Coordination: Popular news items and publications to inform and educate the general public will be prepared by ES, SCS, ASCS and other principal USDA Agencies, with the assistance of the USDA Office of Information. The National Agricultural Library will contribute substantially to internal and external coordination through its establishment and operation of water quality information networks.

NEW AND SPECIAL GROUNDWATER QUALITY INFORMATION ACTIVITIES

A Water Quality Information Center

The Water Quality Information Center (WQIC) at the National Agricultural Library (NAL) will support USDA's research, education, and information dissemination activities. Center staff will provide an information and referral service; strengthen the AGRICOLA database with water quality research and educational/training materials; enhance communication and information dissemination by maintaining an electronic bulletin board conference on water quality and establishing information networks; and develop information products directed toward researchers, educators, farmers, and consumers. NAL will work closely with key Government Agencies, the land-grant community, and other agricultural constituencies.

Major Workshops and Conferences

Annual Research and Development Conference: A conference to be held during February of each year, the audience to include research scientists and administrators, education and technical assistance professionals, producers, agribusinesses, consumers, and other interested groups. Research and developmental results will be presented with specific effort made at the workshop to integrate results and identify those that are ready for timely transfer and users.

Interagency Coordination and Relation to Ongoing Programs

New Directions from Existing Paths

USDA Water Quality Program activities are closely coordinated among USDA Agencies and with the related activities of EPA and Agencies of the Departments of Interior and Commerce under the President's Water Quality Initiative. The USDA Water Quality Program will benefit from related, past and ongoing Departmental efforts in soil and water conservation, public information, research, and extension, and will complement the aims of established programs such as those addressing integrated pest management and low input, sustainable and alternative agricultural systems.

It is clear from the preceding sections that no single planned output from the USDA Water Quality Program is to be produced through the exclusive efforts of a single Agency; all are multi-Agency activities. Also, many of the program's major activities contribute to more than one set of planned outputs. This close integration of program components is predicated upon a network of interagency coordination mechanisms, many of which are in place and others of which are currently under development.

Interagency Coordination: At the Departmental level, the Secretary provides overall direction for the Water Quality Program. Implementation of program plans will be the responsibility of the Department's line Agencies. The Agency heads or their designees will form a special Working Group on Water Quality to oversee and integrate the development, implementation and evaluation of program plans. In addition to the USDA Agencies, the Environmental Protection Agency, the Department of the Interior's U.S. Geological Survey, and the Department of Commerce's National Oceanographic and Atmospheric Administration will be asked to appoint representatives to the work group.

A range of existing, formal and informal interagency agreements can easily accommodate coordination of various new program activities. Where no appropriate mechanism exists, one will be established. For example, committees and working groups have been formed to plan specific aspects of both research and data collection activities, and EPA and USGS representatives have been included in planning meetings.

Relation to Ongoing Programs: New activities to be conducted under the USDA Water Quality Program will take maximum advantage of the structures and outputs of ongoing programs. For example, research on agricultural chemical management systems will capitalize on the products of current research on biological pest control and agricultural engineering. Current research and extension programs on integrated pest management (IMP) and low input, sustainable agriculture (LISA) will both contribute to and benefit by water quality program activities. APHIS will integrate applicable results from the USDA Water Quality Program with its biocontrol and IPM programs and its plant and health monitoring programs. The National Program for Soil and Water Conservation: 1988-97 Update (NCP) provides an integration mechanism for other education and technical assistance elements of USDA's Water Quality Program with current conservation programs. Financial assistance under ASCS's Agricultural Conservation Program will facilitate producers' ability to adopt some water quality protection strategies.

It is expected that by 1994, USDA's approach to interagency implementation and management of its contribution to the President's Initiative on Water Quality will be recognized as an innovative and effective way of addressing Nationally important agricultural problems. Adaptation of this management method to other, ongoing problems will represent a new base for future expansion of the Department's commitment to mutual retention of National agricultural productivity and environmental quality.

Working for the Nature of Tomorrow®

NATIONAL WILDLIFE FEDERATION

1400 Sixteenth Street, N.W., Washington, D.C. 20036-2266 (202) 797-6800

STATEMENT OF
ERIK D. OLSON, COUNSEL,
ENVIRONMENTAL QUALITY DIVISION,
OF THE
NATIONAL WILDLIFE FEDERATION

HEARINGS ON GROUNDWATER POLLUTION

BEFORE THE
SUBCOMMITTEE ON SUPERFUND, OCEAN, AND WATER PROTECTION
OF THE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

100th CONGRESS, SECOND SESSION

AUGUST 1, 1989

I. INTRODUCTION.

Good morning, I am Erik D. Olson, Counsel for the Environmental Quality Division at the National Wildlife Federation. The Federation is the nation's largest citizen conservation organization, with over five million members and supporters nationwide, and with affiliated organizations in 51 states and territories. We thank the Subcommittee for inviting the Federation to testify on the important issue of groundwater.

The Federation commends the members of this Subcommittee, and in particular Senator Lautenberg, for holding these hearings calling attention to the nation's serious groundwater pollution problems. The public's interest in protection of water quality and drinking water is clear. For example, a 1989 report reviewing public opinion polls taken by Lou Harris, Roper, Cambridge Reports, and other recognized national polling companies, concluded that public concern with these problems has steadily increased over the past several years.[1] In 1988, 84 percent of the American public was "very concerned" about fresh water pollution, 63 percent thought toxic waste problems were

---

1. Americans for the Environment, Sierra Club, and National Wildlife Federation, The Rising Tide: Public Opinion, Policy, & Politics (April 20, 1989).

getting worse, and 70 percent thought that the government is doing too little about solid waste.[2] Moreover, in 1988, 55 percent thought that "most" underground drinking water sources are polluted or that "as many underground sources of water are contaminated as are uncontaminated."[3] As recently as 1981, just 28 percent of the respondents felt that contamination was so widespread.[4] Similarly, a 1987 poll of the National Wildlife Federation's Associate members found that drinking water quality was the most important environmental issue to them.[5]

Thus, it is becoming increasingly clear that public concern about groundwater pollution is mounting. We urge the Subcommittee to recognize that while further education and research on groundwater pollution is needed, multi-year research programs must not be used as an excuse to avoid comprehensive groundwater protection legislation that is needed to address directly today's problems. The time has come to enact comprehensive groundwater protection legislation. To date, only

---

2. Ibid.

3. Ibid.

4. Ibid.

5. National Wildlife Federation, 1987 Environmental Quality Index.

the legislation proposed last session by Senators Durenberger, Baucus, Stafford, and Chafee, S. 2091 and S. 2092, which has not yet been reintroduced this session of Congress, would establish such a comprehensive groundwater protection regulatory regime. While the National Wildlife Federation believes that that legislation has gaps and some rough spots, we think that it is the best vehicle introduced to date to debate the important groundwater protection issue.

As the nation ignores the "out of sight and out of mind" groundwater pollution problem, millions of individual pollution sources, ranging from enormous leaking industrial lagoons to improperly operated backyard septic tanks, continue to spread their poisons. They pollute underground sources of drinking water and water that is the lifeblood for many sensitive aquatic ecosystems.

Cleaning up these polluted aquifers is extremely expensive (if it is even possible), on the average costing $21,000,000 to $30,000,000 at each Superfund site,[6] and costing $100,000,000.00 or more at some larger sites.[7] There are about 30,000 sites on

---

6. See, Clean Sites Inc., Making Superfund Work: Recommendations to Improve Program Implementation (January, 1989).

7. For example, at the Rocky Mountain Arsenal Superfund site, cleanup and restoration costs are estimated at $2 billion dollars or more.

EPA's CERCLIS that are being considered for Superfund designation, and over 1100 sites that have been designated or proposed for designation on the Superfund National Priority List for cleanup.[8] GAO has estimated that total cleanup and upgrading costs just at Department of Energy facilities will be as much as $155,000,000,000.00 (billion) dollars.[9]

But this "National Groundwater Debt" at federal facilities and designated Superfund sites is only the tip of the iceberg. In addition to hazardous waste disposal at these sites there are literally hundreds of thousands, and perhaps millions, of other sites at which the groundwater has been polluted by sources such as industrial facility spills and leaks, hazardous substance stockpiles, sewage treatment plants, oil and gas production and refining waste, and agricultural application of pesticides and fertilizers. It simply will not be feasible to clean up the groundwater at every one of these sites.

For this reason, we must start to prevent contamination today, rather than trying to pay to clean up the "Augean stables"

---

8. GAO, Superfund: Missed Statutory Deadlines Slow Progress in Environmental Programs, GAO/RCED-89-27 (November, 1988).

9. See, e.g., GAO, Nuclear Health and Safety: Dealing With Problems in the Nuclear Defense Complex Expected to Cost Over $100 Billion, GAO/RCED-88-197BR (July, 1988).

we have created tomorrow. Prevention of such contamination is far preferable for public health and environmental concerns, and is far less costly as well. The only rational approach is to prevent groundwater pollution before it happens through comprehensive, minimum national groundwater protection requirements.

II. THE EXTENT OF THE GROUNDWATER POLLUTION PROBLEM.

A. Groundwater Pollution Is a National Problem.

Recent studies, including a detailed national survey of groundwater contamination by the U.S. Geological Survey (USGS) released late in 1988, document that groundwater is polluted in all 50 states from a variety of manmade sources.[10] These include hazardous waste dumps, industrial and municipal landfills, hazardous material handling, storage, and transfer, underground injection wells, excessive or inappropriate application of fertilizer and pesticides, intensive animal husbandry, leaking storage tanks above and underground, faulty septic systems, road salt storage and use and many other sources.

---

10. USGS, National Water Summary 1986: Hydrologic Events and Groundwater Quality, USGS Water-Supply Paper 2325 (1988); see also, Office of Technology Assessment, Protecting the Nation's Groundwater From Contamination, (1984).

No comprehensive national groundwater pollution monitoring program exists. However, state and federal groundwater monitoring programs have begun to sound the alarm bells. For example, U.S. Geological Survey tests of over 120,000 wells across the country found nitrate contamination at concentrations above EPA's 10 ppm health standard in over 7,900 of those wells and elevated levels of nitrates (between 3 and 10 ppm) in over 16,300 additional wells.[11] Nitrate contamination can cause infants to lose their ability to absorb oxygen causing the "blue baby syndrome," and may cause other health effects. Nitrate pollution often is linked to improper fertilizer use or to human and animal waste and has been found to exceed EPA's health standard in wells in 48 states.[12] In several states surveyed by USGS or state agencies as many as one in four wells were polluted above safe health levels with nitrates.[13]

Similarly, EPA has found that at least 22 pesticides contaminate groundwater in 24 states and that one in every four wells tested in certain agricultural areas are contaminated with

---

11. Madison, R.J. and J.O. Brunett, "Overview of the Occurrence of Nitrate in Ground Water of the United States," in USGS, National Water Summary 1984, Water Supply Paper 2275 (1985).

12. Ibid.

13. Ibid.

pesticides. On Long Island, New York over 2400 wells have been contaminated with the insecticide Aldicarb and its residues.[14] In Florida, more than a thousand wells were condemned because of ethylene dibromide contamination. A 1986 study of pesticides in groundwater in California found that one in four of the 8,300 wells tested for pesticides were contaminated.[15]

Industrial chemical and waste contamination has closed thousands of wells across the nation. In New Jersey alone, according to one estimate, 5,000 wells have been closed due to groundwater pollution.[16] A few examples of New Jersey's contamination are discussed in recent press clippings attached as Appendix A to this testimony. *

Tests of private wells in some states, such as Kentucky[17] and Pennsylvania,[18] have found that 30 to 50 percent of the wells

---

14. U.S. Environmental Protection Agency, "National Primary Drinking Water Regulations; Synthetic Organic Chemicals, Inorganic Chemicals and Microorganisms; Proposed Rule," Federal Register 50 (219): 46985 (November 13,1985).

15. State of California, Department of Food and Agriculture, Sampling for Pesticide Residues in California Well Water: 1986 Well Inventory Data Base. Report to the Legislature pursuant to the Pesticide Contamination Prevention Act (1987).

16. G. Bishop, "Without Water, Everything Else is a Mirage," [Newark, N.J.] Star-Ledger, Feb. 15, 1989.

17. C. Chriss, "Bad Well Water: Problem is Big, But Little Being Done," Lexington [Kentucky] Herald-Leader, February 28, 1988.

18. B. Birt, "Bacteria Being Found in More Private Water," [Levittown, Pennsylvania] Courrier Times, January 22, 1988.

*Retained in committee files.

tested are contaminated with unsafe levels of bacteria. The list goes on. As we gather more data it is becoming increasingly clear that contamination of the groundwater by industrial, agricultural and many other sources, is serious and widespread.

B. The Health and Environmental Effects of Polluted Groundwater.

Groundwater pollution has emerged as a public health and environmental issue of the first magnitude. Groundwater provides about half of the nation's population with its drinking water. Over 95 percent of rural residents use groundwater for drinking water. Yet groundwater is polluted across the nation by a wide variety of chemicals and pathogens.

The Environmental Protection Agency (EPA) has found that, according to public health records, from 1971-1985 over 52,000 people have become ill in outbreaks of disease or acute chemical poisoning due to drinking contaminated groundwater.[19] According to EPA, some researchers believe that due to underreporting of outbreaks and illnesses, the actual number of illnesses in outbreaks of disease may be twenty five times larger.[20]

---

19. U.S. EPA, Proposed National Primary Drinking Water Regulations; Total Coliforms. 52 Fed. Reg. 42,226 (Nov. 3, 1987).

20. U.S. EPA, Proposed National Primary Drinking Water Regulations; Filtration and Disinfection. 52 Fed. Reg. 42,183 (Nov. 3, 1987).

Tragically, South Dakota officials have reported that high levels of nitrates in groundwater used for baby formula killed an infant in that state recently.[21]

For reasons discussed in greater detail in Appendix B to this testimony, the number of chronic illnesses and latent diseases, such as cancer, caused by polluted groundwater has yet to be determined on a national level. However, two recent studies suggest that these more subtle and insidious effects may be more widespread than once believed. For example, a national study (released in April, 1989) conducted by EPA and academic scientists found "significant associations" between the rates of certain forms of cancer, such as bladder, stomach and intestinal cancer, and counties with hazardous waste sites that have contaminated groundwater.[22] Similarly, another study published

---

21. Water Information Center, Groundwater Newsletter, vol.15 no. 18 at 1 (Sept. 30, 1986); see also, Busch and Meyer, A Case of Infantile Methemoglobinemia in South Dakota, J. of Environmental Health, v. 44., at 310-11 (May/June 1982)(reporting previous nitrate in groundwater related infant poisoning, treated before death resulted, in South Dakota).

22. J. Griffith, et al., "Cancer Mortality in U.S. Counties With Hazardous Waste Sites and Ground Water Pollution," Archives of Environmental Health, vol. 44, no. 2, page 69 (March/April, 1989). The authors cautioned that "more definitive" studies were needed to define the magnitude of these risks, but said that counties with hazardous waste sites leaking into the groundwater could be correlated with certain forms of excess cancers, and that hazardous waste in groundwater could used as an "initial index" of exposure to toxics.

in 1989 found that pregnant women in California who drink tap water pumped from groundwater "had the greatest risk" of having spontaneous abortions, compared to pregnant women drinking bottled water; the specific toxics that might have been responsible for such spontaneous abortions were not identifiable.[23]

Although there are no good national data on the number of cancers, spontaneous abortions, birth defects, or chronic health problems resulting from groundwater pollution, we do know that groundwater in every state is polluted with a cornucopia of organic and inorganic pollutants. Many of these chemicals are suspected of causing an array of health problems, including birth defects, reproductive failure, suppression of the immune system, or cancer.[24] We are just beginning to understand the mechanisms of many of these diseases and simply have not studied in any detail most populations exposed to groundwater pollution.

---

23. I. Hertz-Picciotto, et al., "Spontaneous Abortions in Relating to Consumption of Tap Water: An Application of Methods From Survival Analysis to a Pregnancy Follow-Up Study," American Journal of Epidemiology, vol. 130, no. 1, page 79 (1989).

24. See, e.g., Office of Technology Assessment, Protecting the Nation's Groundwater From Contamination, vol. 1 at 23-36 (1984); National Academy of Sciences, National Research Council, Drinking Water and Health series (1977-1987).

Groundwater pollution problems also can become surface water pollution problems. Nearly a third of the flow of the nation's surface water comes from groundwater and in many surface streams all of the flow originates from groundwater during droughts. Sensitive aquatic ecosystems in surface wetlands and streams, therefore, can be harmed by groundwater pollution, as can the unique subterranean ecosystems that are fed by groundwater in some regions. At many Superfund sites, for example, toxic contamination from buried waste and from leaks has contaminated nearby wetlands and streams and threatened fish and wildlife. Similarly, EPA and other agencies believe that one of the major sources of toxic contamination to the Niagara River may be the seepage of polluted groundwater into the river from the numerous nearby waste dumps and other facilities.[25]

III. COMPREHENSIVE FEDERAL LEGISLATION IS NEEDED.

At a previous hearing before this Committee, one witness argued against federal intervention:

> The effect of this [legislation], if enacted in its present form, is to shoulder aside local, state, and multi-state efforts to deal with the [pollution] problems....This...is,

---

25. See, e.g., "Preliminary Evaluation of Chemical Migration to Groundwater and the Niagara River from Selected Waste Disposal Sites," EPA Report 905-4-85-001 (March, 1985).

> at best premature, in our judgment. The control of...pollution is best handled at the state and local level because it involves a weighing of many interests which local officials are most competent to evaluate. The states and local governments must be given a fair chance to deal with it....
>
> In short, just as the states are getting together to solve their local joint problems, the Federal Government now threatens to apply a heavy hand. It is submitted that this problem is not so critical as to remove it from local and state governments that are now alert to the need for prompt and effective action, and which are now acting.[26]

This testimony was delivered to the Senate Public Works Committee over twenty years ago when opponents of federal clean air legislation were arguing that clean air was a local concern and that the federal government should keep its nose out of states' business. With the leadership of Senator Ed Muskie and his colleagues, Congress soundly rejected these arguments and took steps to protect the American public from air pollution by enacting comprehensive federal clean air legislation.

Today, we hear the same time-worn arguments in the groundwater context. We are told that somehow groundwater pollution is a uniquely local problem, that we should not burden

---

26. Statement of Orville V. Bergen, Illinois Manufacturers Association, in Air Pollution--1967 (Air Quality Act): Hearings Before the Subcommittee on Air and Water Pollution of the Committee on Public Works, United States Senate, on S. 780 and Related Matters Pertaining to the Prevention and Control of Air Pollution, 90th Cong., 1st Sess., Part 3 at 2167-68 (1967).

industry or states with a new federal law that tells them to protect the nation's citizens from polluted groundwater and that the status quo is just fine. Today, however, we all should know better.

Will our children and grandchildren, in the year 2025, look back to the late 1980's, and say, "they had a chance then to prevent the devastation of the nation's groundwater, over 90 percent of our fresh water, but they lacked the vision to save this precious resource?" Will they have to ask why, just over 35 years before, the nation recognized the problem and could have prevented the creation of millions of sites of contamination, but lacked the will and courage to act?

Federal groundwater legislation is needed today, for several reasons:

1. All Americans Deserve Protection.

Every citizen must be guaranteed safe drinking water. It is now painfully obvious that public health and the environment are not adequately protected from groundwater pollution. All Americans, regardless of their State or county of residence, should be afforded at least certain minimum national protections of their health and their environment from groundwater pollution.

2. Current Federal Laws Conflict, Are Inadequately Coordinated, and Have Many Gaps.

While Congress has adopted several laws designed to address some of the sources of groundwater pollution,[27] there is an urgent need for coordination of these and other statutes.[28] There is an even more urgent need to fill the gaps and weaknesses left by those laws.

These gaps include inadequate or nonexistent controls on: many industrial "non-hazardous waste" pits, ponds, lagoons and

---

27. For example, Congress has enacted the Resource Conservation and Recovery Act, the Hazardous and Solid and Waste Amendments of 1984 ("HSWA"), the Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund"), the Superfund Amendments and Reauthorization Act of 1986, and the Safe Drinking Water Act and that Act's 1986 Amendments.

28. Examples of poor coordination and conflict include several federal laws that establish different protection strategies and cleanup standards for precisely the same contaminants that come from different pollution sources. For example, a sewage treatment lagoon at a Publicly Owned Treatment Works receiving toxic industrial waste through sewers might be required to have no groundwater protections, may be purposely designed to percolate waste into the ground, and the groundwater pollution it causes may not be required to be cleaned up. A similar lagoon handling similar contaminants on industrial property next door might be subject to relatively strict hazardous waste containment and cleanup requirements. Similarly, an enormous, unlined "reserve pit" at an oil field containing numerous toxics often would be subject to virtually no groundwater protection requirements, while a landfill on other industrial property containing many of the same toxics in waste designated "hazardous" might have to be monitored and lined. Moreover, even when groundwater cleanup is required, in certain cases EPA interprets the cleanup standards under RCRA to be different from those under Superfund, even though the same contaminants may be involved.

landfills; sewage treatment plant lagoons; municipal landfills; mines and mining waste; oil and gas production waste and reserve pits; agricultural sources of pollution such as pesticides, chemical fertilizers, animal feedlots and chemigation; septic tanks and cesspools; above ground tanks and materials storage and handling facilities; and many other important sources.

The Safe Drinking Water Act's water supply provisions provide no protection from drinking polluted water to the millions of Americans who get their water from private wells.[29] Also, EPA generally has failed to protect users of "noncommunity" public water systems, such as wells used to supply water directly to many restaurants, hospitals, factories and seasonal resorts or camps.[30]

---

29. This is because the Act's Maximum Contaminant Levels for pollutants in drinking water apply only to "public water systems," defined to include systems serving piped water for human consumption to at least 15 service connections or regularly serving 25 or more people. See, 42 U.S.C. § 300f(4).

30. EPA's Inspector General issued a report in September, 1988, that documented a virtually complete breakdown in EPA enforcement and implementation of the drinking water program for noncommunity systems and interstate carrier conveyances (e.g. trains, busses and airplanes) in EPA Region III; EPA admitted in an attachment to that report that all EPA regions' programs are essentially the same as Region III's program. EPA Inspector General, Report of Audit E1HW7-03-0171-81928, Non-Community Water System Program, (September, 1988). Some of the Agency's standards are supposed to protect some noncommunity water supplies from some pollutants, but millions of users of tens of thousands of such systems remain largely unprotected by the federal drinking water program.

3. There Are Serious Gaps in State Protections.

Although some states have begun to attack groundwater pollution aggressively, many have not. Groundwater protection programs in most states mirror the federal requirements under existing federal laws. Thus, the groundwater impacts of major sources of groundwater pollution, such as pesticides and fertilizers, mining, municipal landfills and above ground storage tanks, often are poorly controlled at the state level, if they regulated at all.

4. State and Local Regulators Find it Difficult to Regulate Important Local Industries Without a Federal Mandate.

Because of interstate and inter-community competition to keep and attract economically important industries, many state and local regulators and legislators find it extremely difficult to regulate the groundwater impacts of these industries. Indeed, many states have provisions in their state laws prohibiting state environmental regulators from being any more stringent than federal law requires. These states and communities need a clear federal mandate to allow them to act.

In addition, groundwater, and therefore its pollution, does not respect political boundaries. Therefore, no matter how strict a state's or locality's laws, pollution from lax neighboring states or communities may despoil its groundwater.

5. The Federal Government Is Spending Billions Each Year on Cleanup; These Costs Will Escalate If Preventive Action Is Not Taken Now.

Each year, the federal government and private parties spend billions of dollars cleaning up our past mistakes. Congress has enacted Superfund, with a ten-year trust fund in excess of ten billion dollars. Under the liability provisions in Superfund and the Resource Conservation and Recovery Act (RCRA), the government and private parties will spend many times that amount.[31] The total costs to taxpayers for cleaning up toxic waste dumps on Department of Defense, Interior Department and other federal lands will be well over 100 billion dollars, with clean up on public lands and at private sites extending well into the 21st Century.[32]

---

31. See, e.g., GAO, Hazardous Waste: Corrective Action Cleanups Will Take Years to Complete, at 22 & note 2 (GAO/RCED-88-48) (Dec. 1987)(estimates that RCRA corrective action may cost up to $22.7 billion, and notes that Superfund cleanup costs may cost up to $39.1 billion for up to 4,200 sites.).

32. See, GAO, Nuclear Health and Safety, supra; see also, GAO, Superfund: Civilian Federal Agencies Slow to Clean Up Hazardous Waste (GAO/RCED-87-153) (July, 1987)(criticizing slow federal agency progress in identifying and cleaning up hazardous waste sites on federal lands); GAO, Hazardous Waste: Corrective Action Cleanups Will Take Years to Complete, at 22 & note 2 (GAO/RCED-88-48) (Dec. 1987)(estimates that RCRA corrective action may cost up to $22.7 billion, and notes that Superfund cleanup costs may cost up to $39.1 billion for up to 4,200 sites.)

Of course, waste site clean ups are very important, and are necessary to assure that public health and the environment are not threatened by these toxic sites. But we are spending little on preventing the very same problems from recurring in the future. With each succeeding year of inaction we can be assured that more groundwater pollution sites are being created that will require cleanup. As a nation, we are penny wise and pound foolish.

Our failure to offer even minimal expenditures for protection of groundwater is highlighted by the FY 1989 Budget. The budget includes no money to pay for two very modest groundwater protection programs adopted by Congress in the 1986 Safe Drinking Water Act Amendments: the Wellhead Protection Program and the Critical Aquifer Protection Area program.

It is time for the federal government to recognize that we must now embark on what undoubtedly will be one of the key environmental issues of the 1990's: preventing groundwater pollution. We have a responsibility to act as stewards of the nation's groundwater resources, protecting them for use by future generations. The National Wildlife Federation urges the members of this Subcommittee, therefore, to propose and support the enactment of comprehensive groundwater protection legislation. The elements of such legislation are suggested in Appendix C to

this testimony and more fully discussed in a report issued in 1988 by several major environmental organizations.[33]

IV. CONCLUSION.

There is no justification for waiting for more studies before we begin to require protective measures to prevent groundwater contamination. Without such preventive action, a legacy of scarce, polluted groundwater that may forever be impossible to clean up or use will be our bequest to our heirs. We know enough now to act; let us not miss this opportunity!

---

33. Protecting the Nation's Groundwater: A Proposal for Federal Legislation, (National Wildlife Federation, Environmental Policy Institute, Natural Resources Defense Council, Environmental Defense Fund, et al., June 24, 1988).

Working for the Nature of Tomorrow.
NATIONAL WILDLIFE FEDERATION
1400 Sixteenth Street, N.W., Washington, D.C. 20036-2266 (202) 797-6800

APPENDIX B

THE HEALTH EFFECTS OF GROUNDWATER POLLUTION

By
Erik D. Olson, Counsel
and
Gerald V. Poje, Ph.D., Environmental Toxicologist,
National Wildlife Federation

Serious groundwater contamination occurs in every state in the nation, including contamination above safe health levels in many states by synthetic organic chemicals, nitrates, bacteria, viruses, pathogens and many other organic and inorganic contaminants.

The overall impacts of groundwater pollution upon public health are difficult to establish with precision. As noted in our testimony, while EPA has documented that 52,000 people became acutely ill from drinking contaminated groundwater from 1981-1985,[1] the Agency admits that this number probably underestimates substantially the actual magnitude of acute illnesses.

Chronic diseases, such as cancer, often are very difficult to link to consumption of environmental contaminants.

---

1. U.S. EPA, Proposed National Primary Drinking Water Regulations; Total Coliforms. 52 Fed. Reg. 42,226 (Nov. 3, 1987).

Preliminary epidemiological studies are just beginning at several sites across the country to determine the full magnitude of the health effects of the dumping of cancer-causing agents and other toxic chemicals with chronic effects into our underground water supplies. Two of the most recent studies on these health effects are noted in the main testimony.

Cancer and birth-defect-causing chemicals, and even "immunosuppressive" chemicals that weaken the body's defenses against attack by pathogenic bacteria, viruses and parasites, have been found in the groundwater in virtually every state in which the groundwater has been tested intensively. These organic and inorganic chemicals can come from numerous unregulated or under-regulated sources of groundwater pollution ranging from unlined industrial pits to leaking storage tanks.

In addition, studies of the potential health effects of agriculturally-related groundwater contamination are just beginning to be completed. Agricultural chemicals have been implicated in acute and chronic diseases and in the specific impairment of major organ systems.[2] Drinking water from wells with elevated nitrate concentrations has resulted in

---

2. S. Murphy, "Pesticides," in Casarett and Doull's Toxicology the Basic Science of Poisons (Macmillan Publishing Co., 1980).

methemoglobinemia, a biochemical impairment of the blood's ability to carry oxygen.[3] Nitrites may serve as essential precursor molecules for the formation of nitrosamines, some of which are potent carcinogens. The epidemiological implications of drinking water contamination with nitrates and nitrites have not been fully evaluated. However, some investigators have expressed concern over increased occurrence of stomach cancer[4] and congenital malformations[5] associated with consumption of nitrate and nitrite contaminated drinking water. Exposures to pesticides have been implicated in chronic illness such as

---

3. Infants are particularly susceptible to nitrate poisoning because they have proportionally higher intakes of fluids, their acidic gastrointestinal tracts provide an environment for production of the ultimate toxicant, and their fetal hemoglobin is more sensitive than adult hemoglobin. Busch and Meyer documented a recent case in South Dakota where a six-week-old infant recovered from methemoglobinemia-induced cyanosis (J. Environm. Health, 1982. 44(6):310-311). The Des Moines Register (July 29, 1986, p.1) reported a mortality attributed to nitrate poisoning.

4. O.M. Jensen, "Nitrate in drinking water and cancer in northern Jutland, Denmark, with special reference to stomach cancer," Ecotoxicol Environ Safety 6: 97-101 (1982).

5. M. Dorsch, R. Scragg, A. McMichael, P. Baghurst and K. Dyer, "Congenital malformations and maternal drinking water supply in rural South Australia: a case-control study," American Journal of Epidemiology (1984).

Parkinson's disease[6] and cancer[7] as well.

Establishing conclusively that chronic human illness is caused by chronic low level exposure to chemicals found in groundwater is extremely complex. Several complicating factors may lead decision-makers to understate substantially the public health significance of current low level contamination with nitrogen fertilizers, pesticides and other contaminants.

For many carcinogens the time between first exposure and onset of the tumor is usually no less than 15 years and can be as long as several decades. Similar patterns of long latency may occur with other chronic diseases. Given the increasing use of synthetic organic chemicals within the past two decades, present patterns of illness in agricultural and industrial areas may not accurately reflect future patterns of illness.

Second, epidemiological studies are generally insensitive. Our ability to detect relatively rare diseases such as many forms

---

6. R. Lewin, "Parkinson's Disease: an environmental cause?," Science 229: 257-258 (1985).

7. See, for example: S. Hoar, A. Blair, F. Holmes, C. Boysen, R. Robel, R. Hoover and J. Fraumeni, "Agricultural herbicide use and the risk of lymphoma and soft-tissue sarcoma," Journal of American Medical Association 256(9): 1141-1147 (1986). Also, L. Burmeister, G. Everett, S. Van Lier and P. Isacson, "Selected cancer mortality and farm practice in Iowa," American Journal of Epidemiology 118(1): 72-77 (1983).

of cancer (e.g., leukemias, liver tumors, soft-tissue sarcomas), depend upon surveying large numbers of people. When epidemiologists aggregate highly vulnerable people and very slightly vulnerable people into a single, large exposure group, the results tend to show a lower average occurrence of disease than is experienced by the most highly susceptible individuals. Toxicological testing shows that susceptibility to a particular chemical varies: between infants and adults; between men and women; between pregnant and non-pregnant women of child-bearing age; among people of different genetic backgrounds; and between healthy and unhealthy people.

Third, because of inadequate toxicological testing, we simply do not know the full range of adverse health effects caused by many chemicals, including both the active and so-called "inert"[8] pesticide ingredients. For example, some pesticides are known to cause neurological damage, but EPA has not established a protocol

---

8. As of April 21, 1987 EPA divided the approximately 1200 "inert" ingredients into four categories: 1. Inerts of Toxicological Concern: 50 chemicals known to be toxic; 2. Potentially Toxic Inerts/ High Priority: 60 inert ingredients which are structurally similar to known toxicants; 3. Inerts of Unknown Toxicity: Approximately 800 ingredients of which EPA has inadequate information to determine toxicity; 4. Inerts of Minimal Concern: 300 inert ingredients that are generally recognized as safe. The lack of available health and safety information betrays our greater inability to assess the toxic hazards of many pesticide formulations.

for testing all pesticides for these effects. For most pesticide ingredients EPA will not require tests to identify which cause birth defects unless it believes that a large number of women will be exposed. Cancer testing is incomplete for the majority of synthetic organic chemicals, including most pesticides. Furthermore, for the most part, toxicological tests have focused upon single chemicals, and therefore little data is available for assessing the health and safety of chemical mixtures such as pesticide formulations.

Fourth, laboratory toxicological data suggesting that exposure to a low level of a chemical is "safe" may be misleading. In the real world people are exposed to several chemicals at once. Increased risks may occur through either simultaneous or sequential exposure to several chemicals. Some interactions may be antagonistic: simultaneous exposure to two chemicals results in lower damage than would be caused by either chemical if administered alone. Other interactions may be synergistic: simultaneous exposure to two chemicals result in greater damage than would be caused by either chemical if administered alone. For the vast majority of chemical combinations, there are no data to describe their interactions.

Fifth, current monitoring captures only a small sample of potential contaminants[9] and present exposure levels may not reflect the past history of exposure. Public water suppliers are not required under EPA's implementation of the Safe Drinking Water Act to monitor for the most widely used organic chemicals. In general, the government does not assess private water well quality. "Inert" ingredients in pesticide formulations are generally claimed as trade secrets, and therefore these chemicals are not sought during monitoring efforts.

In summary, no comfort should be taken from partial monitoring studies which indicate "only low levels" of contamination. Today's exposures may lead to diseases many years from now. Current epidemiological evidence cannot assure the health safety of these levels. Toxicological data are woefully inadequate to pro-

---

9. In August, 1987 EPA issued draft health advisories for 50 common pesticides with a high potential for contaminating drinking water. Only 15 (30%) advisories indicated that standard analytical methods and detection limits for the pesticide in water were available. For 7 (14%) pesticide health advisories, no analytical method was available.

Only during the past year has EPA developed methods to detect a significant number of pesticide active ingredients and break-down products. According to EPA's Project Summary, this past year's National Pesticides in Groundwater Survey pilot tested five new multi-residue methods, which along with two older methods will analyze for the presence of about 120 pesticides (70 "priority pesticides and 50 "non-priority" pesticide chemicals).

vide assurances of safety for any single chemical. Real world exposures will include simultaneous and sequential exposures to a barrage of chemicals. Finally, present methods for measuring agricultural chemicals open only a tiny window to view the world of chemical contamination in the environment.

Thus, while we know that each year thousands of Americans become acutely ill from drinking contaminated groundwater, the true magnitude of the effects of groundwater on public health has yet to be fully revealed. What we know may be the tip of the iceberg.

Working for the Nature of Tomorrow®
NATIONAL WILDLIFE FEDERATION
1400 Sixteenth Street, N.W., Washington, D.C. 20036-2266 (202) 797-6800

APPENDIX C

THE ELEMENTS OF COMPREHENSIVE
GROUNDWATER POLLUTION PROTECTION LEGISLATION.

Comprehensive groundwater pollution protection legislation should have as its goal the prevention of pollution of all the nation's groundwater so that today's generation will bear the costs of its own economic and social activities. The law should assure that all current and future Americans will have safe water to drink and that the biological, chemical and physical integrity of the nation's groundwater resources will be protected.

To achieve these goals the law should require national technology or methodological standards for groundwater pollution sources, requiring that those responsible for each source must do the best that can be done to avoid pollution. For some large sources of pollution, such as industrial landfills and impoundments, permits imposing these source controls should be required. For other more numerous and individually difficult to regulate sources, such as septic tanks, states should be given sufficient flexibility to come up with effective control methods. The law also should take us beyond the "end of the pipe" pollution control method and should establish numerical goals for reducing the amount of waste generated.

Federal groundwater legislation should establish national minimum groundwater quality standards, based on human health and

ecological impacts, that would serve as a "backstop" to assure that pollution source controls are working; these standards, however, should not become "pollution licenses" up to which the avoidable groundwater pollution may be allowed.

The federal government, through the EPA, must also take an active role in approval and oversight of state programs and the federal government must be obligated to implement or enforce federal groundwater protection programs in the event that states fail or choose not to do so.

Groundwater classification would be utilized to provide for an additional level of protection for particularly vulnerable or particularly crucial groundwater resources. In no case should classification be used to lessen the stringency of established technological standards. We cannot know today the needs of generations hence for groundwater that some would have us "sign off" as disposal zones.

Federal groundwater legislation should provide for public access to information and active involvement in the development of state and federal program regulations, permit approvals and enforcement and oversight activities. A federal right of action should be included in the statute.

The legislation should get the federal house in order. It should require a detailed plan for protecting the groundwater

that is critical to maintaining the continued vitality of the one third of the nation's land that is in the federal domain. The legislation also should direct that the government's many groundwater protection activities be better coordinated through an inter-agency committee but should not give the Office of Management and Budget more authority in doing so.

STATEMENT ON THE MINNESOTA GROUND WATER PROTECTION ACT OF 1989

By

Linda Brusseau
Section Chief of Program Development Section
Ground Water and Solid Waste Division
Minnesota Pollution Control Agency

Before The
U.S. Senate Subcommittee on
Superfund, Ocean and Water Protection

August 1, 1989

Washington, D.C.

Chairman Lautenberg and members of the subcommittee, my name is Linda Bruemmer and I am chief of the Program Development Section in the Division of Ground Water and Solid Waste at the Minnesota Pollution Control Agency (MPCA). The purpose of my testimony today is to discuss the state's new ground water protection act and its relationship to the state's reliance on ground water.

The Minnesota Ground Water Protection Act of 1989

In May 1989, the Minnesota Legislature passed and the Governor signed into law the Minnesota Ground Water Protection Act, Laws of Minnesota 1989 chapter 326. This law established a framework for the protection of Minnesota's ground water. The framework centers around a state goal of preventing the degradation of our ground water. It also defines the procedures for promoting and then requiring the use of good management practices to keep pollutants out of the ground water. It is important to remember that this new framework complements the existing mixture of laws, regulations, and programs.

State Reliance on Ground Water

Minnesota's ground water is a valuable yet vulnerable resource which has gained increased attention over the past several years. We rely on it as a safe source of drinking water for two of every three Minnesotans. In addition, it is a critical component in many industrial processes and to the agricultural industry of the state. Minnesota has an abundance of high quality ground water in the aquifer system of bedrock and unconsolidated glacial deposits in a large portion of the state.

In spite of the historically clean and abundant ground water, we are finding the evidence of past neglect and abuse. Current indications are that while a relatively small percentage of available ground water has been degraded, incidents of contamination are widespread and there is a continuing supply of new sites which are discovered and investigated through the state and federal Superfund programs.

Reliance on ground water has increased dramatically in the past decade. In 1976, ground water was 14 percent of the total water withdrawn. Currently, that figure is closer to 25 percent. Generally, this water use is in the categories of public water supply, rural domestic and livestock use, irrigation, and self-supplied industrial use. Public water supplies and irrigation together account for close to 60 percent of the ground water use in Minnesota. Despite the generally positive picture of supply and demand, there are localized shortages due to well interference or contamination and major, unpredictable events such as drought conditions.

A rough approximation of the potential threat to our ground water can be seen by looking at the numbers of potential sources of ground water contamination. There are close to 6,000 businesses in the state which are believed to generate hazardous waste. Approximately 140 of them need Resource Conservation and Recovery Act (RCRA) permits to treat, store, and/or dispose of hazardous waste. Slightly more than 1,400 active and closed landfills and dumps were counted in the 1980 MPCA Open Dump Inventory. Although 131 of these facilities do have solid waste disposal permits, at least 25 have inadequate ground water monitoring systems. New solid waste facility rules went into effect in November 1988 with new standards for operation, maintenance, and closure of solid waste facilities with the protection of public health and resources as an underlying goal.

In addition to land disposal sites, there are an estimated 300,000 individual septic systems plus an additional number of larger drainfields and land application systems serving municipalities and industries. A third of a million tons of sewage sludge is spread at 1,000 sites across the state. Nonpoint source run-off has been identified as a contributor of bacteria and nutrients as it either infiltrates or enters the ground water through wells no longer in use. There are 130,000 miles of roadways which represent not only an accident potential but are salted each winter. There are nearly 600 salt storage areas to support that effort.

There are an estimated 60,000 underground bulk storage sites in Minnesota. Leakage from the underground storage of liquids, mostly petroleum products, is estimated to be occurring in 10-25 percent of all underground tanks. There are currently from 600-800 active sites in the state being investigated for clean up under the combined state and federal underground storage tank and petroleum cleanup fund programs.

Currently, there are 157 sites identified on the MPCA's State Superfund priorities' list, including 54 landfills. The majority of these sites involve ground water contamination by organic solvents.

Recent surveys have uncovered low levels of pesticides in 39 percent of the wells tested in sensitive areas of the state; nitrate levels exceeding health limits in over 40 percent of the private wells and 7 percent of the public wells tested in these areas; and volatile organic chemicals, such as solvents or petroleum derivatives, in 8 percent of the community water supply wells in one study and in 25 percent of the private wells near landfills in a different, limited study.

The State Strategy for Ground Water

In Minnesota, the water programs are spread throughout numerous agencies. In addition to my agency (the Minnesota Pollution Control Agency), the Department of Health, the Department of Natural Resources, the Department of Agriculture, the Board of Water and Soil Resources, and the Environmental Quality Board all share in various aspects of water regulation and planning. With this number of actors involved, there has been concern that there was no underlying strategy driving these programs. The state has undertaken a number of ground water protection strategy efforts which improve with each iteration. In 1979, the state water plan, "Toward Efficient Allocation and Management: A Strategy to Preserve and Protect Water and Related Land Resources," was completed. In 1983, under section 208 of the Clean Water Act, the MPCA prepared the "Ground Water Protection Strategy Framework for Minnesota" as an inventory of the state's ground water programs. As a follow-up, Governor Perpich asked that a Ground Water Protection Strategy Issue Team Report be prepared in 1985 to identify specific emerging issues and needs.

Two key state strategies were developed in 1988 to help decide how best to protect Minnesota's ground water. Under the direction of the U.S. Environmental Protection Agency's Office of Ground Water in Region 5, Minnesota used Clean Water Act 106 funds to develop the Minnesota Ground Water Protection Strategy

(September 1988). Concurrently, the Environmental Quality Board's Water Resources Committee prepared "A Strategy for the Wise Use of Pesticides and Nutrients" (December 1988). The goal of these strategies is serve as the blueprint for future ground water, pesticide, and nutrient management activities at the state level, and also help define the local role in ground water management and protection.

The Ground Water Bill

From these strategies and all the public input provided in review and comment on the strategies, a ground water bill was drafted by the state water program professionals and proposed to the Governor for inclusion in his environmental package. Differing versions of the bill worked their way through both bodies of the Minnesota Legislature, resulting in over 30 hours of hearings in the final conference committee to arrive at a final package.

The New Law

The ground water law establishes landmark water policies in several areas. The cornerstone of the law is the degradation prevention goal. In the past, the MPCA operated with regulations that stated a nondegradation policy, but the Ground Water Protection Strategy pointed out the need to extend this policy to all state programs with the endorsement of the Minnesota Legislature. The bill begins with the following statement:

> It is the goal of the state that groundwater be maintained in its natural condition, free from any degradation caused by human activities. It is recognized that for some human activities this degradation prevention goal cannot be practicably achieved. However, it is intended that it be achieved. Where it is not currently practicable, the development of methods and technology that will make prevention practicable is encouraged.

The bill was divided into 10 articles which will now be inserted into existing law. A significant amount of the language deals with pesticide and fertilizer programs because the legislators felt this area of regulation needed to be greatly expanded to provide adequate controls on fertilizer and pesticide application.

Following is a synopsis of the major policy elements of the Ground Water Protection Act. A more detailed summary is attached.

- The Minnesota Ground Water Protection Act of 1989 establishes a sensible policy framework for ground water protection that:

  - sets a state goal of keeping our ground water free of pollution;
  - addresses the special needs of areas of the state sensitive to contamination; and
  - combines education, research, and regulations to prevent further contamination of ground water, dividing responsibilities between the Department of Agriculture for fertilizers and pesticides and the MPCA for all other pollutants.

- It directs the Department of Health to establish Health Risk Limits for toxicants for which there is no federal drinking water limit.
- It provides, for the first time, a system to track construction and abandonment of wells, and provides for a pilot well-sealing grant program.
- It provides the state money for monitoring of public drinking water supplies as required under the Safe Drinking Water Act.
- It bans the use of new once-through cooling systems, and assesses a fee on existing systems.
- It provides the authorities and staff needed by the Minnesota Department of Agriculture to reduce contamination of ground water from fertilizers and pesticides.
- It accelerates efforts to promote alternatives to chemicals based upon the concepts of sustainable agriculture and integrated pest management. State agencies are directed to use integrated pest management in the management of state lands.
- It establishes a program for the collection of waste pesticides to help farmers safely dispose of banned or unwanted pesticides.
- It establishes a pilot pesticides container pick-up program and bans nonreturnable pesticide containers by July 1, 1994, to help keep from generating new pesticide wastes in the future.
- It provides for state grants to counties for completing and carrying out local plans to protect ground water.
- It accelerates research on the sensitivity of ground water to contamination through the development of regional geologic assessments and county geologic atlases.
- It calls for the coordination and integration of water data through the State Planning Agency and provides state funding for the MPCA's Integrated Ground Water Information System which is being developed under federal 106 grant money.
- It charges the Environmental Quality Board and a new Legislative Water Commission with responsibility for coordinating and monitoring implementation of the legislation.

Finally, the law provides a balance in funding between the General Fund ($8.3 million) and fees (between $8.1 and $8.7 million), with each contributing about half of the $16.4 to $17 million authorized. The funding package was controversial but endorsed by the major actors. The Environmental Quality Board's advisory committee recommended that the funding be taken out of the general fund because all citizens of the state benefit from clean water.

Because of limitation on the amount of money in the general fund, fees are often identified as an alternative source of funding. There is a balance in the kinds of fees approved. Fees on the use of ground water for once-through cooling will raise $2.7 million. Fees for well construction and monitoring will raise another $2 million. Finally, fees on the registration of agricultural chemicals and licensing of facilities, dealers, and applicators will raise up to $4.0 million.

Thank you, Mr. Chairman, for the opportunity to present Minnesota's new water law. I will be glad to answer any questions and thank you for your interest.

A SUMMARY OF THE GROUNDWATER ACT of 1989

Article 1
Groundwater Protection

- States a goal that groundwater be maintained in its natural condition, free from degradation whenever practicable. (Sec. 1)

- Definitions are provided for the purpose of the chapter created by article 1 (103H). Terms defined are: agricultural chemical, health risk limits, best management practices, common detection, degradation, fertilizer, groundwater, pesticide, plant amendment, pollutant, pollution, registered use, registrant sensitive area, soil amendment, water resource protection requirements. (Sec. 2)

- A process is established for the commissioner of natural resources and the Minnesota geological survey to designate sensitive areas. Sensitive areas are those areas where because of natural features there is significant risk of contamination of groundwater from activities near or at the surface. (Sec. 3)

- Conservation easements are allowed for areas designated as sensitive areas and land in or immediately surrounding a sinkhole. (Sec. 4)

- A provision for a defense to liability is provided for a person who implements and maintains projects and practices from an adopted soil and water conservation plan that applies to the person's property and protection of groundwater. (Sec. 5)

- The commissioner of agriculture for agricultural chemicals and the pollution control agency for other pollutants must develop best management practices (BMPs) for the prevention of groundwater degradation. BMPs are by definition voluntary practices. (Sec. 6)

- All monitoring of groundwater quality by state agencies and political subdivisions must be submitted to the environmental quality board. The board will assess the quality of the data and maintain a computerized database of groundwater data submitted. (Sec. 7)

- The commissioner of health is required to promulgate health risk limits for substances degrading groundwater. The commissioner must review and revise, if necessary, the limits every four years. Existing recommended allowable limits for drinking water may be adopted by the commissioner as health risk limits.

- The commissioner of agriculture for agricultural chemicals and the pollution control agency for other pollutants are required to evaluate the detection of pollutants in groundwater. The commissioner or the agency must evaluate whether the pollution results from common detection and continue monitoring and evaluation to determine the pollution frequency and concentration trend. (Sec. 9)

- The commissioner of agriculture for agricultural chemicals and the pollution control agency for other pollutants are required to manage pollutants where groundwater degradation is detected. Where degradation is detected the commissioner of agriculture or the pollution control agency must promote the implementation of BMPs.

- If BMPs are not effective, the commissioner of agriculture or the pollution control agency must adopt water resource protection requirements (WRPRs) that prevent and minimize pollution. The WRPRs can be for the whole state or for a portion designated by order of the commissioner of agriculture or the pollution control agency. (Sec. 10)

- The pollution control agency and the department of agriculture, in consultation with the board of water and soil resources, are required to conduct a study on nitrogen compounds in groundwater. The study will be submitted to the legislative water commission by July 1, 1991. The commission must provide recommendations to the legislature by November 15, 1991. (Sec. 11)

Article 2
Water Research Information and Education

- The legislative water commission is created to review state water policy and make recommendations to the legislature. The committee will consist of five members each from the house and the senate. The committee will sunset on June 30, 1995. (Sec. 1)

- The commissioner of agriculture must establish a clearinghouse and other assistance to agricultural producers on sustainable agriculture and promote the use of integrated pest management.

- An environmental agricultural program is established. The board of water and soil resources, after review by the joint legislative committee on water and the Minnesota future resources commission, must award contracts for the program. (Sec. 3)

- Conservation easements under the reinvest in Minnesota resources program are allowed for sensitive areas and hillsides used for pasture. (Sections 4 to 6)

- The environmental quality board must prepare and submit a report on water research needs to the joint legislative committee on water and the Minnesota future resources commission by September 15 of each odd-numbered year. (Sec. 7)

- The local water resources protection and management program is established under the board of water and soil resources to provide assistance to counties to develop comprehensive local water plans or to carry out water resource protection programs identified in the water plans. (Sections 8 to 10)

- Sensitive areas and wellhead protection areas are added as components for which the comprehensive local water plans under statute must address. (Sec. 11)

- The University of Minnesota is added as an ex officio, nonvoting member of the board of water and soil resources. (Sec. 12)

- Additional water planning duties are added to the duties of the environmental quality board and the board must have a new plan and strategy by November 15, 1990, and every five years thereafter. (Sec. 13)

Article 3
Wells, Borings, and Underground Uses

- The current wells, borings, and underground uses provisions in Minnesota Statutes, chapters 156A, 145A, 105, 84, 469, and 471 are recodified in chapter 103I.

- A permit is required for all non-drive point wells constructed. Emergency permit exemptions are provided to protect public health or welfare, or to allow a well contractor to begin construction prior to obtaining a permit. Drive point wells are exempt from the permit requirement but after December 31, 1989, the owner of the well must notify the commissioner of health on the installation and location. A maintenance permit is required for a well that is not in use, inoperable, and unsealed. (Sec. 9, subdivisions 1 to 3)

- A well contractor's license is required to drill, construct or repair a well except:

  (1) a registered professional engineer, or certified hydrologist or hydrogeologist may construct a monitoring well;

  (2) a limited well contractor may modify well casings or screens, construct drive point wells, or install pumps or pumping equipment;

  (3) an individual constructing a well on land they owe or lease for farming or a place of abode; or

  (4) an individual performing labor or service for a contractor under the direction of the contractor. (Sec. 9, subdivision 4)

- At grade monitoring wells are allowed for leak detection devices. (Sec. 9, subdivision 5)

- Potential sources of contamination may not be placed closer to a well than isolation distances prescribed by the commissioner of health. (Sec. 9, subdivision 6)

- A well identification label is required for all new wells. (Sec. 9, subdivision 7)

- A report of well completion or sealing must be submitted to the commissioner of health within 30 days of completion. The commissioner of health must send a copy of the report to the commissioner of natural resources, the local soil and water conservation district, and the Minnesota geological survey. (Sec. 9, subdivision 8)

- Permit fees are established as follows:

  - for a new well that produces less than 50 gallons per minute, $50;
  - for a new well that produces 50 gallons per minute or more, $100;
  - for an inoperable well, construction of a monitoring well or dewatering well, a groundwater thermal exchange device, or vertical heat exchanger, $50;
  - annually for an unsealed monitoring well, $50;
  - annually for a dewatering well, $25. (Sec. 10)

- After July 1, 1990, a seller must disclose the location of known wells before signing an agreement to transfer real property.

- A seller who fails to disclose the existence of a well at the time of sale is liable to the buyer for costs and reasonable attorney fees, relating to the sealing of a well. (Sec. 14)

- The statute of limitations for a landowner's cause of action against a person whose action or inaction caused contamination of a well is established at six years after the owner discovers the contamination. (Sec. 15)

- Well sealing requirements are established for a well that:

  - is contaminated;
  - was not sealed according to the provisions of this chapter; or
  - endangers groundwater or is a safety or health hazard.

- Monitoring wells and dewatering wells must be sealed when no longer in use. (Sec. 16)

- The commissioner of natural resources must identify the location of abandoned wells located on state property.

- The state is prohibited from purchasing or selling land without identifying the location of all wells. (Sec. 17)

- The commissioner of health may order a well sealed that is:

  - an imminent threat to public health or safety;
  - required to be sealed under section 16; or
  - a monitoring or dewatering well for which a maintenance permit is not renewed or obtained within 14 months after construction. (Sec. 18)

- Counties must issue sealed well certificates for wells properly sealed. (Sec. 19)

- The landowner liability for a sealed well is removed for contamination of groundwater from the well that occurs after the well is sealed, on wells that have properly recorded sealed well certificates. (Sec. 20)

- A well sealing cost share program is established in the board of water and soil resources to provide grants to counties. The program sunsets June 30, 1995. Grants will be targeted to counties based on: the diversity of well construction, geologic conditions, and land use; current use of affected aquifers; and aquifer susceptibility to contamination by unsealed wells. The state cost share is up to 75 percent or 2,000. After July 1, 1991, only a well sealing that is a priority action identified in approved local water plans will be eligible for assistance. (Sec. 21)

- A property owner may apply to the board of water and soil resources for funding to seal wells. (Sec. 22)

- The commissioner of health and the board of water and soil resources have a governmental services lien for the costs of wells contracted to be sealed. (Sec. 23)

- Elevator shaft borings may not be made without a permit from the commissioner of health. (Sec. 24)

- Environmental bore holes must be constructed by a well contractor or monitoring well contractor. (Sec. 25)

- The license fees for a well contractor's license is $250, and an elevator shaft contractor's license is $50. An application fee for each of $50 is also required. A statewide surety bond of $10,000 in lieu of license bonds required by political subdivisions is required. (Sections 30 and 33)

- A limited well contractor's license and a limited well sealing contractor's license, with a license fee of $50 each, are provided for. (Sections 31-32)

- After December 31, 1990, monitoring well contractors who seek initial registration must meet examination and experience requirements of the commissioner of health. A statewide surety bond of $10,000 in lieu of license bonds required by political subdivisions is required. Application fees will be set by the commissioner of health. (Sec. 34)

- All drilling machines or pump hoists used for an activity licensed under this chapter are required to be registered with the department of health. (Sec. 35)

- Administrative remedies including denial, suspension, or revocation of licensure and administrative penalties are provided. (Sections 44 and 45)

Article 4
Water Conservation

- Provisions on agricultural irrigation permits and consistency of permits with state, regional, and local water plans, deleted in section 2, are recodified. (Sec. 1)

- The water allocation priorities are amended to place power production that meets contingency planning provisions within the first priority. Power production in excess of a contingency plan remains at fourth priority. (Sec. 2)

- No new appropriation permits may be issued for once-through cooling systems using in excess of five million gallons annually. (Sec. 4)

- A water use processing fee is established for each water use permit, replacing the current statutory system. Except for once-through cooling systems, the water use permit fee is based on .05 cents per 1,000 gallons for the first 50 million gallons and .1 cent per 1,000 gallons for amounts above 50 million gallons. The maximum is $2,000. The fee for once-through cooling systems is set at 5 cents per 1,000 gallons until December 31, 1991, 10 cents per 1,000 gallons during calendar years 1992-1996, and 15 cents per 1,000 gallons thereafter. The fees are based on permitted capacity and a fee must be $25 or more. (Sec. 5)

- Rules are authorized for conservation of public water supplies. (Sec. 6)

- Joint powers water management organizations are given authority to require water appropriation permits for nonessential uses below 10,000 gallons per day and one million gallons per year on protected watercourses in the metropolitan area with a drainage area less than 25 square miles. (Sec. 7)

- The commissioner of natural resources must study and report by February 15, 1990, to the legislative water commission, on the impact of consumptive water use on existing aquifers. (Sec. 8)

Article 5
Pesticide Amendments

- New definitions are provided for collection site, container, corrective action, local unit of government, owner of real property, pesticide end user, returnable container, and waste pesticides. (Sections 1 to 15)

- The commissioner of agriculture must develop a pesticide management plan for the prevention, evaluation, and mitigation of the occurrence of pesticides and pesticide breakdown products. (Sec. 17)

- The state must use integrated pest management techniques on public lands. (Sec. 18)

- Monitoring of urban and rural pesticide use must be done by the commissioner. (Sec. 19)

- The commissioner of agriculture is required to establish a waste pesticide collection program to collect waste pesticides from pesticide end users. The commissioner may assess costs for disposal on the end users and use the money in the waste pesticide collection account to pay for expenses of the program. (Sec. 20)

- A Chemigation permit and antisiphon device are required for applying pesticides through an irrigation system from any source of irrigation water. (Sections 25-26)

- A fertilizer chemigation permit holder is exempt from the pesticide chemigation permit fee. (Sec. 27)

- After June 30, 1994, pesticide dealers and distributors must accept waste pesticides that remain in the original container unless there is a designated place in the county to return the unused portion. (Sec. 29)

- The annual application fee for pesticide registration is increased from $125 to one-tenth of one percent for 1990 and, thereafter, one-fifth of one percent of gross sales of the pesticide within the state, with a minimum fee of $150. (Sec. 31)

- A person intending to discontinue registration of a pesticide in Minnesota must complete a total recall of the pesticide in the state within 60 days. (Sec. 33)

- The commissioner of agriculture, in conjunction with the extension service, must develop innovative educational and training programs addressing pesticide concerns. (Sec. 34)

- The certification period for a private applicator is reduced from five years to three years. (Sec. 46)

- The department of agriculture, in consultation with the pollution control agency and the Minnesota extension service, is required to develop a pesticide container collection and recycling pilot project. The department is required to report to the legislature by November 30, 1991, on recommendations for managing pesticide containers. (Sec. 52)

Article 6
Fertilizers, Soil Amendments, and Plant Amendments

- The current provisions on fertilizers, soil amendments, and plant amendments from Minnesota Statutes, chapter 17, are recodified in chapter 18C.

- New definitions are provided for best management practices, chemigation, compost, custom apply, deficiency, environment, fertilizer, incident, investigational allowance, manipulated, rinsate, site, safeguard, substantially altering, unreasonable adverse effects on the environment, and wildlife.

- Sewage sludge, except for the labeling requirements, and compost transferred between parties without compensation are exempt from the requirements of this chapter. (Sec. 8)

- Storage, handling, distribution, and disposal provisions similar to those required under the pesticide laws are provided for fertilizer, rinsate, fertilizer containers, and fertilizer application equipment. A backflow prevention device must be used when filling fertilizer equipment directly from any waters of the state. (Sec. 10)

- A chemigation permit and an antisiphon device are required for applying fertilizers through an irrigation system. (Sec. 11)

- A person who stores fertilizers, soil amendments or plant amendments in bulk must have a contingency plan. (Sec. 17)

- The commissioner of agriculture, in conjunction with the Minnesota extension service and crop consultant community, is required to develop recommendations for a crop consultant certification program and report on the recommendations to the legislature by November 15, 1990. (Sec. 32)

- The commissioner of agriculture is required to appoint a nitrogen fertilizer task force to study the effects and impact on water resources from nitrogen fertilizer use. The task force shall report their findings to the commissioner by May 1, 1990, who in turn must report to the environmental quality board by July 1, 1990. (Sec. 33)

Article 7
Agricultural Chemical Incidents and Enforcement

- The pesticide incidents and enforcement provisions are recodified from chapter 18B and made to apply to fertilizers, plant amendments, an soil amendments.

- Definitions are provided for agricultural chemical, corrective action, hazardous waste, incident, owner of real property, person, provision of this chapter, and responsible party. (Sec. 1)

- An agricultural chemical end user or landowner is not liable for costs associated with application not in violation of state law or orders of the commissioner. Compliance with state law and orders of the commissioner of agriculture is a complete defense to liability. (Sec. 2)

- The commissioner of agriculture may order a responsible party to take corrective action for an agricultural chemical incident. (Sec. 4)

- A responsible person is liable for corrective action costs including administrative costs. (Sec. 5)

- A responsible person has the right to have liability apportioned among responsible parties. (Sec. 6)

- The commissioner of agriculture, upon presentation of official credentials, must be granted access at reasonable times to all sites for the purpose of inspection where agricultural chemicals are used or stored. (Sec. 7)

- The commissioner of agriculture is given the power to seek administrative remedies similar to those authorized under the pesticide laws. (Sec. 9)

- Damages may be awarded by a court for an administrative action by the commissioner without probable cause. (Sec. 10)

- The commissioner of agriculture may assess an administrate penalty of up to $1,500 per day for violations of a corrective action order or remedial action order. (Sec. 11)

- Persons may appeal an administrative order of the commissioner of agriculture within 45 days of receiving an order. The office of administrative hearings will conduct the hearings on the contested case. (Sec. 12)

- Civil and criminal penalties are provided which are similar to provisions in the current pesticide laws, except that the civil penalty is up to $7,500 per day. (Sections 3 and 4)

Article 8
Agricultural Chemical Incident Payment and Reimbursement

- Definitions for the purpose of this article are provided for agricultural chemical, board, fund, eligible person, and wholesale sale. (Sec. 2)

- The agricultural chemical response and reimbursement account is established in the state treasury. (Sec. 3, subd. 1)

- Expenditures from the account may be used for payments:

  - for the commissioner of agriculture's responses to incidents under the pesticides and fertilizer laws;
  - for emergency responses that are otherwise unable to be funded; and
  - to reimburse and pay corrective action costs under section 4. (Sec. 3, subdivision 2)

- The commissioner of agriculture must set a response and reimbursement fee based on the amount needed for payments under subdivision 2 and maintain a minimum balance between $1 million and $5 million in the account. (Sec. 3, subdivision 3)

- Interim fees for 1990 are established as surcharges on pesticides registration, fertilizer tonnage, and agricultural chemical businesses and applicators. (Sec. 3, subdivision 4)

- The fee after 1990 shall be surcharges proportional to and not greater than the 1990 fees. (Sec. 3, subdivision 5)

- The reimbursement payments to eligible persons are 90 percent of the corrective action costs between $1,000 and $100,000 plus 100 percent of the costs equal to or greater than $100,000 but less than $200,000. (Sec. 4)

- A five-member agricultural chemical response board is created to administer the new account. (Sec. 5)

- The commissioner of agriculture is given access to the environmental response, compensation, and compliance fund for incident response to agricultural chemical incidents for which there is liability under Minnesota Statutes, chapter 115B. (Sec. 7)

- The commissioner of agriculture, in consultation with the pollution control agency, is required to review the environmental response, compensation, and compliance fund priorities list to determine the appropriateness of ranking criteria for agricultural chemical releases. The commissioner shall report to the legislature by January 1, 1990. (Sec. 8)

- The commissioner of agriculture shall conduct a study of agriculture chemicals that pose the greatest risk of incurring corrective action in the state. The commissioner is required to report to the legislature by January 15, 1990. (Sec. 9)

Article 9
Watershed Districts

- A 22-member metropolitan local water management task force is created to study and report on metropolitan local water management issues. The task force must submit the report to the governor and the legislature by December 15, 1989. (Sec. 1)

Article 10
Appropriations

- $13,000,000 is appropriated from the general fund as follows:

Health	
Water Well Management Program	1,840
Safe Drinking Water Program	2,600
Water Pollution Limits Information	250
	(4,690)
Agriculture	
Administration of Sustainable Agriculture Grants	100
Water Quality Monitoring/Technical Support/Laboratory	450
	(550)
Board of Water and Soil Resources	
Comp. Local Water Management	100
Local Water Resources Protection	3,220
Environmental Agricultural Program	400
Well Sealing Cost Share Program	530
Metropolitan Watershed Task Force	25
	(4,275)
Joint Legislative Committee on Water	170
Department of Natural Resources	
County Atlas Development	365
Regional Groundwater Assessment, Gauging, & Technical Assistance	1,600
	(1,965)
Pollution Control Agency	
Develop and Implement BMPs and Technical Assistance	250
Integrated Groundwater Information System - IGWIS	250
	(500)
State Planning Agency	
Groundwater Data Integration	200
University of Minnesota	
Integrated Pest Management	350
Experiment Station Research - Agriculture Impact on Groundwater	300
	(650)

Protecting Minnesota's Waters

A Strategy for the Wise Use of Pesticides and Nutrients

December 1988

prepared by

EQB Water Resources Committee

[The following has been excerpted from the above named report. The report in its entirety has been retained in committee files.]

Protecting Minnesota's Waters

A Strategy for the Wise Use of Pesticides and Nutrients

EXECUTIVE SUMMARY

Pesticides and nutrients are widely used throughout society for the control of plant and animal pests and promotion of healthly vegetative growth. The benefits of their use are evident in agricultural production, landscape management, noxious weed control and health protection. These same substances, however, have the potential to contaminate water resources if they are not managed wisely.

Contamination of surface and ground waters resulting from the use of pesticides and nutrients has been observed throughout the United States and in Minnesota. Sources of contamination include spills and leaks, mishandling during application, improper disposal, and use particularly in vulnerable areas. Once contaminated, waters can be difficult and costly to cleanup, making prevention of contamination the most prudent course of action.

Minnesota has a strong history of environmental protection, and has many authorities and programs which serve to prevent contamination of our water resources. These include the pesticide control, safe drinking water, and water pollution control laws and programs. These authorities provide the framework for the state's efforts to address pesticide and nutrient contamination.

As part of its continuing efforts to evaluate state water resources problems and develop policies for dealing with those problems, the Environmental Quality Board (EQB) has prepared a strategy outlining the actions which should be taken to protect water resources from pesticide and nutrient contamination. The ultimate goal of the strategy is to safeguard the health of Minnesotans and protect water resources from pesticide and nutrient contamination, while maintaining a strong economy.

Policy Directions

The policy directions were developed to define the course of action to be taken to achieve the strategy goals. These policies call for an integrated approach, recognizing that education, research, monitoring, incentives, regulation and coordination are all necessary, and for reliance on existing authorities and programs. They

further emphasize the role of individual behavior and actions in resource protection and the need to focus on overall resource sustainability. Finally, they establish prevention of contamination as the cornerstone of the state's efforts, and nondegradation as the state's long-term water resource protection goal toward which program, research and other efforts would be geared.

Initiatives

Specific methods and approaches to be taken to promote the wise use of pesticides and nutrients and protect water resources have been structured around three initiatives.

Information, education and incentives.
Wise use of pesticides and nutrients can best be achieved by ensuring that individuals are provided with the necessary education and information to make informed management decisions and to understand the consequences of mismanagement. Specific recommendations include: 1) establishing a water resources education advisory committee to coordinate the development and dissemination of educational materials; 2) Improving and expanding public information and education efforts and training programs; 3) expanding the use of demonstration projects; and, 4) developing financial incentives.

Resource evaluation and research.
Additional efforts are needed to improve our knowledge of pesticide and nutrient contamination problems, prevention practices and alternative management approaches, and, therefore, our ability to prevent contamination and advise individuals on wise management. Efforts recommended include: 1) developing and implementing a coordinated monitoring plan to better characterize contamination problems; 2) establishing an interagency and academic technical committee to identify research needs, examine practices and disseminate research results; 3.)increasing efforts to identify best management practices; and, 4) continuing research efforts.

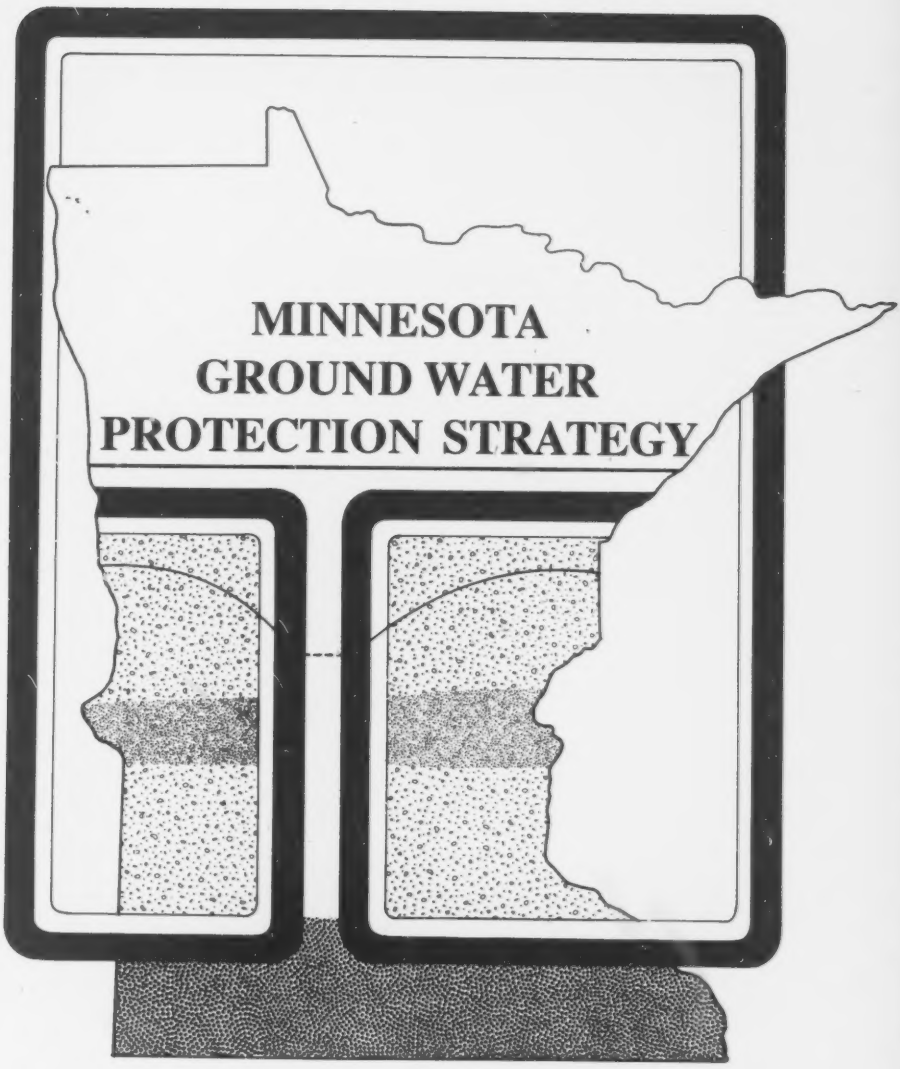
Preventive planning and regulatory efforts.
Existing authorities and programs directly or indirectly influence the use of pesticides and nutrients and the prevention or mitigation of impacts on water resources. Wise use and prevention of contamination can be fostered through better coordination, application and modification of these efforts. Specific recommendations include: 1) adopting a nondegradation goal and numerical limits and factoring these into existing programs; 2) expanding drinking water protection efforts, including enforcement of the water well construction code; 3) developing a state pesticide management plan to guide prevention efforts and delineate actions to be taken when contamination occurs; 4) integrating pest and nutrient management into existing efforts, including government uses of pesticides and nutrients; and, 5) enhancing control efforts in such areas as the application of fertilizers through irrigation systems and the disposal of wastes.

Funding

Expanding our efforts to prevent contamination of water resources and promote the wise use of pesticides and nutrients requires increased resources and stable funding. Enforcement efforts related to the state Pesticide Control Law are currently supported by fees, and should continue to be so supported.

Funding for overall, nonregulatory efforts such as education, research and monitoring should be broad based, since all users of water, pesticides and nutrients benefit. General fund dollars derived from income and sales taxes, including a possible tax on pesticides and nutrients, should be considered for these purposes. Moneys from dedicated funds should also be pursued.

Finally, methods of funding cleanup and pesticide and container disposal should be developed.



September, 1988

[The following has been excerpted from the above named report. The report in its entirety has been retained in committee files.]

PURPOSE OF THE STRATEGY

This Strategy will serve as the blueprint for future ground water management activities at the State level, and also help define the local role in ground water management and protection. The Strategy is built on the strong regulatory framework which the State has established. State agencies already have statutory authority to establish ground water standards and regulate pollution sources, to protect and monitor drinking water supplies, to regulate water appropriation, and to regulate the sale and use of agricultural chemicals which may impact ground water quality. These water related functions are coordinated through the Water Resources Committee of the EQB, a board composed of the top executive officers of the major environmental agencies together with citizen members.

The Strategy has been structured around four major initiatives:

I. To protect ground water quality now and for the future, to ensure safe drinking water supplies, and to prevent ground water contamination by effectively regulating sources of pollution.

II. To ensure adequate water supplies, to regulate water appropriation and use for protection of highest priority users, and to improve coordination of quality and quantity aspects of regulatory programs.

III. To enhance the current body of knowledge on Minnesota's ground water resource, delineating problem areas and providing information needed to effectively manage the resource.

IV. To provide the public, decision-makers, regulators, and the regulated community with the necessary information and education for making environmentally sound decisions in areas which may impact ground water.

MAJOR LEGISLATIVE CONCEPTS

The Strategy recommends the following major legislative initiatives.

*Prevention of contamination should be the top priority. This includes establishment of a goal of nondegradation for all ground water, development of numerical limits on ground water pollutants, and delineation of the especially sensitive areas of the State where special protective measures must be taken at the land surface to ensure protection of the resource below. Strong continued support is needed for cleanup of existing problems.

*Drinking water protection is crucial to the health and welfare of all Minnesotans. Components of this effort include the State developing a Wellhead Protection Program, promotion of better contingency planning and conservation measures, registration of all wells on property deeds and testing of wells at the time of property transfer, development of a prioritization scheme and incentive fund to address the problem of abandoned wells, and enforcement of the Water Well Construction Code.

*Ground water information and education are vital to the success of the prevention and cleanup efforts. Components of this effort are the development of educational opportunities for children and adults, the dissemination of information on our ground water resource and State programs to protect it, specialized training for target groups, and the furtherance of intergovernmental communication.

*Enhancement of local government participation in environmental protection is a critical need as well. The Strategy recommends development of a grant mechanism which would provide funds to local government for the development and implementation of local programs to address environmental concerns. State agencies should be authorized to develop rules for delegation of certain programs to local governments, and have staff in place for technical assistance to aid local governments in program development and implementation.

*Ground water resource evaluation, monitoring, and research are needed for effective management of the resource. The extent of existing contamination is not documented, minor aquifers are not mapped, and recharge areas of major aquifers are not fully and clearly delineated. Research is also needed in the development of alternative technologies to replace current practices which impact ground water. The Strategy recommends development of a fund which would help to foster stable, long-term resource evaluation, monitoring, and research.

*Control of pollution sources is a necessary component. Increased funding for staff in regulatory programs and for programs such as the Clean Water Partnership is needed to continue these efforts. Another important area is pollutant source reduction for both current and potential sources of pollution. Technical assistance in source control and reduction will be a necessary component.

More detail on these legislative initiatives follows in later sections of the Strategy.

NJPIRG

New Jersey Public Interest Research Group
99 Bayard St., New Brunswick, NJ 08901 (201) 247-4606

Testimony of the New Jersey Public Interest Research Group

on Ground Water Protection

Presented by Jeannie Jenkins

Before the Senate Subcommittee on Superfund, Ocean, and Water Protection

Committee on Environment and Public Works

August 1, 1989

Good morning. My name is Jeannie Jenkins. I am a biologist with the New Jersey Public Interest Research Group (NJPIRG). NJPIRG is a non-profit, non-partisan, research and advocacy organization working on environmental, consumer and good government issues. NJPIRG has over 70,000 members across the state. USPIRG, the national lobbying office for the state PIRG's, has over 1 million members nationwide.

We appreciate the opportunity to testify today. NJPIRG has a long history of working for improved protection of ground and surface waters of the state. We would like to take this opportunity to discuss some of the concerns we have about ground water quality in New Jersey, the ways our state is working to protect waters and some of the steps we feel still need to be taken if we are to have clean, plentiful ground water into the next century.

WHAT IS GROUND WATER

The state of New Jersey is proposing to define ground water as all waters in the saturated zone of soil. This will be the definition for ground water used in this testimony.

USES OF GROUND WATER IN NEW JERSEY

Protection of ground water is of vital concern to New Jersey. New Jersey has extensive ground water supplies in high yielding aquifers throughout most of the state. Approximately one-half of the State's population, or four million people, are dependent on ground water as a source of drinking water. Almost 90% of the 622 community water supplies obtain all or part of their drinking water from ground water. In addition, there are approximately 400,000 private potable wells in the state (1). Withdrawals of ground water for industrial, commercial and agricultural uses also occur throughout the state.

Ground water is also an important source of water for New Jersey's rivers and streams. In the southern part of the state, it is thought that ground water discharges to streams contribute between 65 and 90 percent of the base flow to the waterways (2). In addition, ground water provides significant flow to waterways in other parts of the state. Certainly the quantity as well as quality of the state's ground water is critical to healthy surface waters.

Ground water diversions can have significant adverse impacts on both the quality and quantity of particular aquifers. As a result of intense aquifer use and increasing development, New Jersey has designated two areas as Water Supply Critical Areas. Critical Area #1 includes four aquifers in portions of three central and southern counties (Middlesex, Monmouth and Ocean) and Critical Area #2 includes one aquifer covering portions of eight southern counties (Camden, Burlington, Gloucester, Salem, Cumberland, Atlantic, Monmouth, and Ocean Counties).

THREATS TO GROUND WATER

Widespread low level contamination of ground water with hazardous chemicals has been known since at least the late 1970's. Currently, measurable levels of synthetic organic chemicals have been found in 18-21% of municipal water supplies. Estimates of the number of contaminated private wells, currently unregulated in New Jersey, are at least as high (3). From 1984-1987, the New Jersey Department of Environmental Protection (DEP) reported that approximately 5,000 municipal and private wells from 12 counties were significantly contaminated (4). The entire ground water or well fields for seven New Jersey municipalities have been listed as Superfund sites (Fair Lawn; Bergen Co., Rockaway Borough; Morris County, Beachwood and Berkeley; Ocean Co., Cinnamonsen; Burlington Co., Lodi; Bergen Co., Pohatcong Valley; Warren Co., and Rockaway Township; Morris Co.) (5).

A statewide study of ground water quality released in 1981 by the DEP found measurable levels of hazardous substances including volatile organic chemicals, pesticides and heavy metals in a number of wells. Out of 670 wells included in the study, 111 showed volatile organic contamination greater than 10 ppb, standards for metals were exceeded in 29 wells, and pesticides were detected in 31 wells (6).

Industrial Sources

Potential sources of ground water contamination are numerous. New Jersey has 1,200 known or suspected hazardous wastes sites and state officials estimate that between 2,000 and 3,000 additional sites need investigation (7). Ground water contamination is possible at all these sites. There are

approximately 5,000 industrial facilities discharging wastes into rivers, streams, the ocean or sewage treatment plants in the state. 800 industrial facilities are required to monitor discharges to ground water under the NJ Water Pollution Control Act and 20% of these facilities are thought to require long-term ground water remediation (8). Several hundred reports of spills to land and water by industrial facilities are cataloged each month by the state DEP (9). Further, the DEP estimates that 15,000 industrial facilities in the state may be subject to cleanups, including ground water remediation, under the NJ Environmental Cleanup Responsiblity Act (10).

Underground Storage Tanks

Underground storage tanks represent another potential source of ground water contamination in New Jersey. The DEP estimates that there are 60,000 underground storage tanks in the state. 1100 storage tanks have been listed as containing hazardous substances and another 53,000 of the tanks contain petroleum products (11).

Agricultural and other Non-Point Sources

The impact of agricultural and other non-point sources on ground water quality is largely unknown. The NJ DEP has recently completed a preliminary survey examining pesticide and nitrate levels in potable wells near agricultural areas. Preliminary data indicate significant nitrate contamination in some areas of the southern part of the state. Pesticide residues were detected in one quarter of the potable wells monitored and elevated nitrate concentrations were found in one third of the wells. The problem has been attributed to both septic systems and agricultural field runoff (12). Further work will need to be done to determine the magnitude of this problem.

Residential and Industrial Withdrawals

Increased residential development as well as use by industrial and commercial facilities continues to require tremendous ground water withdrawals each year. The DEP estimates that 26 billion gallons of ground water were withdrawn for industrial uses alone during 1987 (13). Approximately 70% of these industrial withdrawals were from aquifers in the state's two Water Supply Critical Areas. Overuse of aquifers is of particular

concern not only for the sheer quantity of water withdrawn but also because of the increased potential for contamination. Overdrawn areas are more susceptible to salt water intrusion in coastal areas as well as to plumes of contamination that may be present in the ground water.

COSTS OF PROTECTING GROUND WATER

The costs of protecting ground water supplies has never been accurately calculated. However, it is clear that prevention is always less expensive than the cost of cleanup. For instance, The DuPont facility located in Deepwater, New Jersey has committed 39 million dollars to ground water clean up as a result of hazardous contaminants seeping from unlined waste canals and an onsite lagoon. Few corporations or municipalities can afford these types of costs.

In examining the costs of contaminated ground water, factors that should be considered in addition to ground water, surface water and soil remediation include medical expenses of workers and local residents exposed to contamination, economic losses to industries such as fishing and tourism, and remediation of water for use as drinking water, industrial uses, and in agricultural use settings.

STEPS NEW JERSEY HAS TAKEN TO PROTECT GROUND WATER

New Jersey has been in the forefront in developing new programs to protect ground water. Unfortunately, this attention has been necessitated by the serious threats to ground water quality in the state. New Jersey has used the power granted it under the federal and state Water Pollution Control Acts to require facilities with a high liklihood of polluting ground water to obtain monitoring permits. Through these permits, New Jersey has collected important and timely information on sources of ground water contamination.

New Jersey has also embarked upon an ambitious program to protect potable wells from pollution sources. Although this program is still in its infancy due to disagreements over who will pay for the surveys of well sites, it portends to be a significant step forward in protecting both municipal and clusters of private wells from contamination sources.

The Underground Storage Tank Registry Program has already provided considerable information on the number and location of tanks and their contents. The next step, determining the potential for ground water contamination from each of these sites will require much additional work.

New Jersey is also in the midst of mapping aquifers in the state and determining critical recharge areas. This process is due to be completed in 1992. The information provided through this work is essential to determining what areas of the state are most sensitive to ground water degradation and to overuse.

Finally, New Jersey is in the process of developing ground water standards similar to those already adopted for surface waters. These standards will represent the cornerstone in ground water protection. The numeric standards set through this process will determine the extent to which New Jersey is willing to protect its waters, and who bears the financial burden for protecting and enhancing ground water.

STEPS NEEDED TO PROTECT GROUND WATER

While New Jersey has moved toward increased protection of ground water, this state, and the nation must go further. NJPIRG views a serious need for improvement in several areas if strong, protective ground water policies are to be set forth.

1. Development of Broad Strategies to Protect Ground Water Quality and Quantity.

Protection of ground water should be viewed as a national concern. Ground water is best protected though regional planning. In many cases, aquifers and sources of contamination cross county and state lines. In developing strategies, the regional impacts of local development pressures including septic usage and ground water withdrawals should be considered. In addition, the protection of recharge and other ecologically sensitive areas will be critical.

2. Discharger disincentives.

A permitting program similar to that used for surface water dischargers should be developed. Discharge fees or taxes should be charged to facilities with ground water permits. Standards should be adopted that provide maximum protection for ground water and place the cost of remediation on polluting facilities.

3. Clearer Focus on Ground Water Protection and Consideration of Toxics Use Reduction Initiatives.

Currently, regulations covering ground water focus almost exclusively on remediation rather than prevention. Regulations governing cleanup standards are far more common than criteria limiting discharges to ground water. The best way to prevent ground water contamination is through the reduction of toxics use at the source. While end-of-the-pipe strategies play an important role in environmental protection strategies, the long term solution to the toxics problem lies in prevention.

CONCLUSIONS

New Jersey has one of the best ground water programs in the nation. This says as much about New Jersey's willingness to take the environmental lead as it does about the poor state of ground water protection in this country. New Jersey, like other states is dependent on high quality, plentiful supplies of ground water for a variety of uses. Also, similar to other states, its ground water is threatened from a multitude of sources. Perhaps, the serious problems already facing New Jersey's ground water will serve as the necessary warning for the rest of the country.

Strong, uniform protection of this resource should be provided through federal legislation. Regional approaches to ground water protection should be encouraged. The tremendous costs of ground water remediation argue strongly for increased attention to be placed on prevention as the long-term answer to ground water protection. Disincentives to pollute and increased emphasis on reducing the use of toxics at the source will be critical to a successful ground water protection strategy.

Notes

1. New Jersey Department of Environmental Protection (DEP), Division of Water Resources, New Jersey 1988 State Water Quality Inventory Report, May 1988.

2. Ibid.

3. Jerald Fagliano, Environmental Health Services, NJ Department of Health, Personal Communication.

4. NJ DEP, Division of Water Resources, Bureau of Water Supply. Contaminated Wellfield Projects database, January 1988.

5. USEPA, Comprehensive Environmental Remediation, Compensation, and Liability Information System (CERCLIS).

6. NJ DEP, Office of Cancer and Toxic Substance Research, Ground water Quality in New Jersey: An Investigation of Toxic Contaminants, March 1981.

7. USEPA, CERCLIS list.

8. NJ DEP, Division of Water Resources. New Jersey 1988 State Water Quality Inventory Report, May 1988.

9. NJ DEP, Bureau of Release Prevention, Accidental Release database.

10.NJ DEP, Division of Water Resources, New Jersey 1988 State Water Quality Inventory Report, May 1988.

11. NJ DEP, Bureau of Underground Storage Tank, Registry of Underground Storage Tanks database.

12. NJ DEP, Judith B. Louis NJ DEP and Eric Vowinkel, US Geological Survey, Effect of Agricultural Chemicals on Ground-Water Quality in the New Jersey Coastal Plain, March, 1989.

13. NJ DEP, Bureau of Water Allocation, Mike Bleicher, Personal Communication.

NEDA
GROUND WATER PROJECT

Roger Strelow, Project Chairman
John Quarles, Vice Chairman and Counsel

National Environmental Development Association • 1440 New York Avenue, NW Washington D.C. 20005 • (202) 638-1230

Testimony Presented By

Roger Strelow, Vice President, General Electric
and
Chairman, NEDA Ground Water Project

Before

Subcommittee on Superfund, Oceans and Water Protection
Senate Committee on Environment and Public Works

August 1, 1989
9:30 a.m.
406 Dirksen Senate Building

Thank you for this opportunity to testify before the Subcommittee today on an important environmental issue, ground water protection. I am Roger Strelow, Vice President of GE for Environmental Programs and Chairman of the National Environmental Development Association (NEDA) Ground Water Project. The Project is broad-based coalition of diverse industries (manufacturing, electronics, chemicals, mining agricultural products and oil), and labor interests (building and construction trades) created to present balanced perspectives on solving the nation's ground water problems.

NEDA/Ground Water, along with other groups, (EESI, the Conservation Foundation, and the National Research Council) supports a new federal-state partnership in which states bear the primary responsibility for groundwater management. We believe, however, that any ground water improvements must be designed with a recognition that ground water is different from other environmental media and needs an approach quite different from that employed in our surface water and air pollution control programs.

Our call for an improved approach to ground water protection and remediation is a recognition of the fact that private and governmental resources are limited and that ground water programs will have to be designed and carried out on a far more localized basis than traditional environmental programs.

Unlike surface water and air, ground water's contact with living systems is often limited by hydrogeological factors and by how and for what purpose it is withdrawn. The potential for ground water protection and remediation is dominated by these factors -- and they vary on a site-specific basis.

Following is a summary of the Project's specific recommendations related to ground water policy.

Increase Federal Support for Research and State Ground Water Programs

NEDA/Ground Water supports the federal role under existing laws for remediation programs and in protecting drinking water. Although NEDA urges better coordination with state programs, the Project also recommends an increased federal role with regard to financial and technical assistance to support ground water management activities, such as providing scientific criteria for standard-setting; developing monitoring and sampling methodologies; collecting and disseminating information; and resolving interstate disputes.

NEDA/Ground Water supported ground water research legislation along with a dozen other Washington industry groups in a June

20 letter sent to both House and Senate members. The Project also supported last year's H.R. 791 as well as many of the provisions in S. 20.

Strengthen State Programs

State and local governments should continue to be responsible for designing and carrying out programs to managing their own ground water resources. States should develop comprehensive ground water management programs, tailored to the local physical conditions of the resource and designated uses or likely uses of aquifers or segments of aquifers. These programs, should be coordinated among existing state and federal programs and should be designed to protect current and future uses of aquifers and their recharge areas.

Program Management Elements

The Project recommends that states select appropriate program elements when developing ground water management programs, including classification by use; uniform national standards for drinking water; controls on point and non-point sources; special controls to protect critical aquifers and adequate enforcement mechanisms. The actual program elements that a state selects must be tailored to local conditions and local needs.

Standards

NEDA/Ground Water recommends that state managers adopt ground water quality standards based on the present or future use of aquifers or segments of aquifers. These standards, to be developed using criteria developed by the federal government, should be applied to protect withdrawal for beneficial use.

Classification by Use

The NEDA/Ground Water Project favors comprehensive use classification and believes that it should be a major focus of any ground water protection program. However, development of protection and remediation programs should not be held in abeyance in the meantime. Imminent hazards and known problems should be addressed promptly under existing state or federal programs.

Efficient Use of Resources

NEDA/Ground Water believes both protection and remediation are important elements of ground water management programs, but that these elements must be developed independently. The benefits to be derived from protection efforts are different

from those that can reasonably be expected from remediation programs. Therefore, their goals, priorities and approaches will generally be different.

Both the decision to remediate and the selection of the cleanup goal and techniques should be site-specific with a goal directed toward re-establishing designated uses for ground water.

****

My remarks have been made in an attempt to provide constructive assistance to the Subcommittee. NEDA would be pleased to provide information or suggestions that may help the Subcommittee determine what the legislative steps might best meet the goal of a new federal-state partnership that is need to protect ground water.

GW1200LAZ